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ORIGINAL ARTICLES

A PRELIMINARY REPORT OF AN INVESTIGATION OF APICAL ROOT RESORPTION OF PERMANENT TEETH*

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A RADIOGRAPHIC survey of 385 treated cases in my orthodontic practice has disclosed conditions in regard to apical root resorptions so startling, so potent in danger to the orthodontic patient, so prolific of recrimination to the orthodontist himself, that I make bold to present this preliminary report to the orthodontists of the world.

Grateful acknowledgment hereby is made of the help from members of the dental profession in the preparation of this report. I will use three cases, other than those from my own practice among the illustrations, to show that tooth root resorption is not confined to one locality. In order to secure even an approximate degree of accuracy in determining frequency of resorptions I have been obliged to use cases from my own practice.

As this is a preliminary report of the investigation, it is impossible at this time to reach definite conclusions in regard to the causes of root resorptions; not only are there many phases to the subject, but there are comparatively few statements in the literature dealing with this problem. All I can hope to accomplish at this time is to interest orthodontists in the subject, with the desire that all will check their cases thoroughly, and collect and correlate all available material. In this manner men with trained minds, having the required scientific background, may assist in the investigation of this problem and, if possible, we may arrive at a solution.

ANATOMIC VARIATIONS

In approaching this phase of the subject, let us first consider evidence that it is not unusual for teeth to have short roots. In the extracted maxillary central incisors shown in Fig. 1 (Cases A and B) the roots taper abruptly

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to rather blunt ends, without the amputated appearance characteristic of resorptions. These may be called anatomic variations. The radiodontist not infrequently discovers teeth with similar roots in mouths where there has been no orthodontic intervention.

Fig. 2 (Case C) illustrates teeth with short roots. These are particularly interesting in that they are in the mouth of a tall, strong, young lady, twenty-three years of age, who has always been healthy. Had this been an

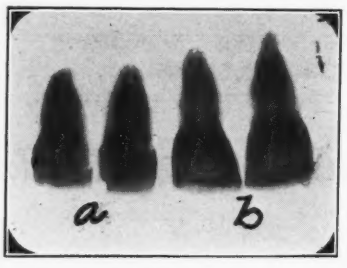


Fig. 1.



Fig. 2.

orthodontic case, how natural it would have been to have made a diagnosis of root resorption induced through orthodontic intervention.

Case D illustrated in Fig. 3 is of a patient sixteen years of age who was referred for diagnosis before orthodontic treatment. The radiograms show pathologic conditions, but it is doubtful whether the pressure produced by the impacted supernumerary tooth and cyst was the cause of the shortened roots. This hypothesis is supported by an examination in the maxillary region of the left side of the mouth in which the second premolar is apparently as short as the second premolar on the right side; and the left lateral incisor root is no longer than the right. This may be a borderline case,

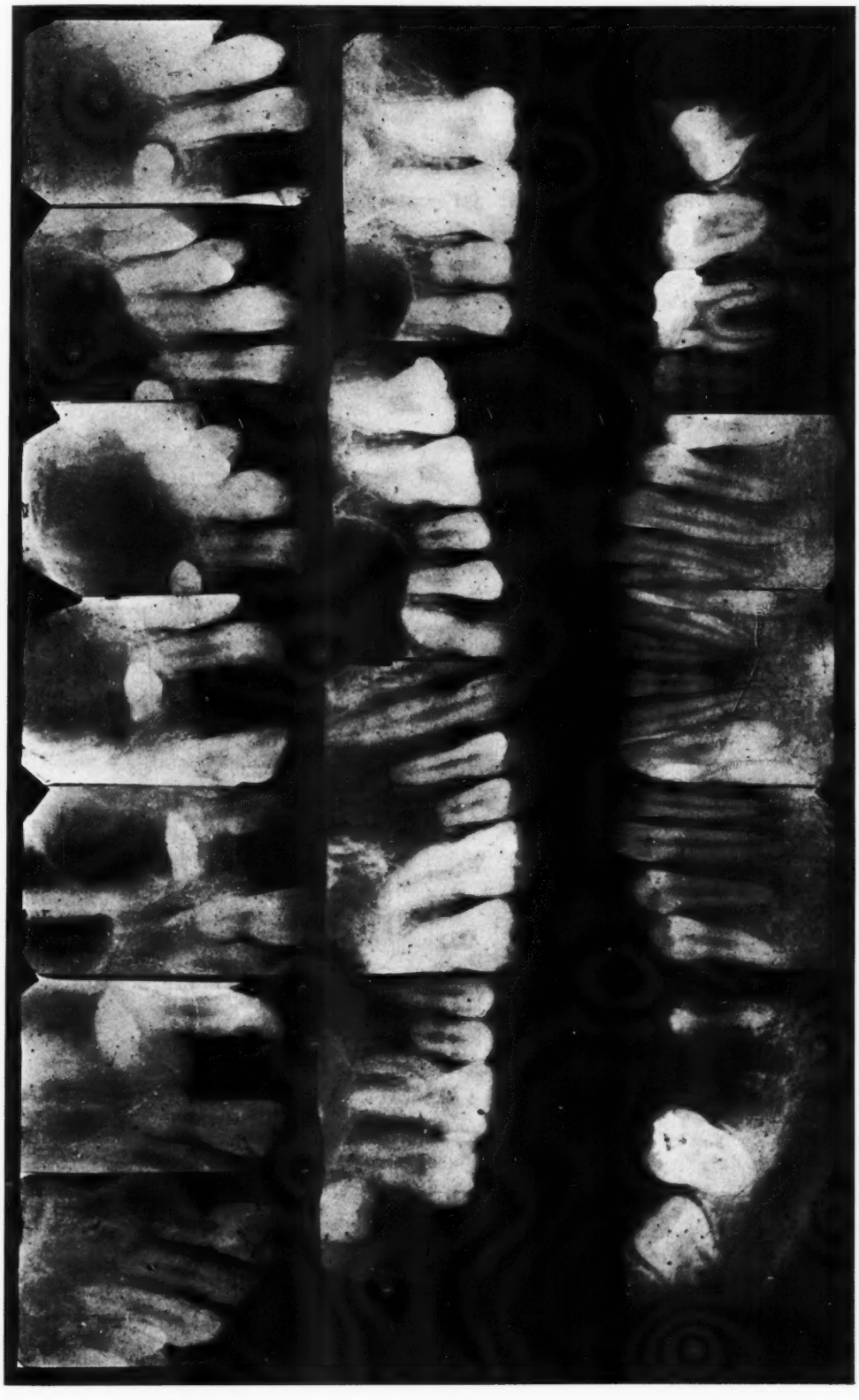


Fig. 3.

or one having some teeth which may be called anatomic variations and other teeth which are resorbed.

RESORPTIONS THROUGH IMPACTIONS

Resorptions of the roots of permanent teeth, which have apparently occurred on account of the proximity of the crown of an impacted permanent tooth to the affected root are comparatively common.

In Fig. 4 (Case E) is shown apical root resorption, with the ultimate loss of the permanent right maxillary lateral incisor. The first radiogram was made when the patient was eight years of age, and shows the right canine directly over the root end of the lateral incisor. In an endeavor to stimulate development so that the impacted permanent canine would move toward its normal position, the maxillary arch was expanded rapidly in the region of the right deciduous molars and canine. The second and third radiograms show that this was only partially successful, and that resorption of the lateral incisor root continued.



Fig. 4.

Fig. 5 (Case F) shows a series of radiograms loaned by Dr. Allen Suggett. The first series, made before treatment, shows resorption on the distal sides of the maxillary lateral incisor roots, apparently due to the proximity of the crowns of the impacted canine teeth. The second series, made a year later, or after expansion of the arch to make room for the eruption of the left canine, shows some resorption of the end of the left lateral incisor root.

RESORPTIONS DURING TREATMENT

Fig. 6 (Case G) shows radiograms of extracted maxillary incisors in which the right central and left lateral were vital, and the left central and right lateral were non vital. The roots, apparently once fully formed, have become shortened, except the left lateral, with the apices blunt as though they had been amputated. In the radiograms these present an appearance similar to many of the tooth roots that have been observed in radiograms of orthodontic patients. These teeth had not received orthodontic treatment, neither had the teeth in Figs. 1, 2 and 3.

Now let us study a little more intensively the interpretation of root resorptions. Fig. 7 (Case H) shows the maxillary incisors in an open bite

case of a patient seventeen years of age, the first series being made in September, 1922. The second series were made after two years' treatment. These show the lateral and central incisor roots with typical amputated appearance. Radiograms of the mandibular teeth, made on the same dates as those of the maxillary, show that there has been no resorption of these incisor roots, although the same type of appliance (the ribbon-bracket) was used on both.



Fig. 5.



Fig. 6.

Fig. 8 (Case I) shows the first radiograms of a twelve-year-old patient. These show the condition of the incisor roots in a distoclusion case in which the maxillary canines were protruding without space in the arch for their reception. Attention is called to the small spot in the film next the left mandibular canine indicated by arrow.

This patient (Fig. 9) was treated with bands upon the maxillary incisors having hooks upon their labial surfaces in which a round arch wire of 0.030 diameter rested. The radiograms in Fig. 9 (Case I) were made seven and a half months after those in Fig. 8. Attention is called to the change in the apical end of the left maxillary lateral incisor root, also to the increase in

density of the aforementioned spot over the root of the mandibular left canine.

The third series of radiograms of this patient (Fig. 10, Case I) were made one year after those shown in Fig. 9. These show the progressive loss through resorption of the apical ends of the maxillary lateral incisor roots. The radiograms of the left mandibular canine region show the opaque spot to be a supernumerary tooth which is forming in a lingual position between the canine and first premolar.

The extraoral radiograms made in the first x-ray examination did not include the left mandibular first premolar and canine region, neither did the intradental radiograms. This emphasizes the importance of covering, in the

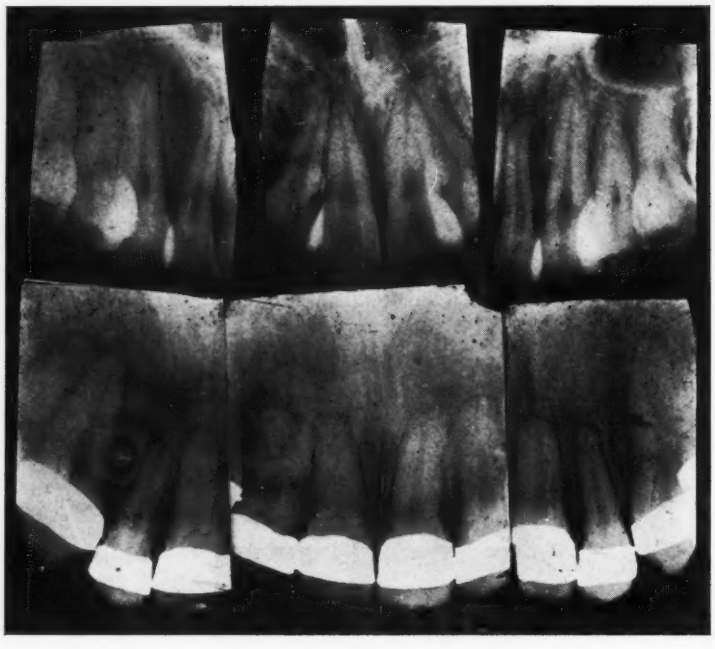


Fig. 7.

x-ray examination each and every tooth and a portion of the jaw surrounding the teeth.

Fig. 11 (Case J) shows the radiogram of the right maxillary incisor region in the case of a patient fourteen years of age at the beginning of treatment. Unfortunately the radiograms of the incisors, made before treatment was started, are not clear enough for good reproduction; however, Fig. 11 shows that the root of the right maxillary central incisor was well formed. The right maxillary canine was impacted, with the lateral incisor almost touching the first premolar. Bracket-bands were placed upon the maxillary lateral incisors and the right central incisor, while the left central incisor was only ligated to the ribbon arch.

The varying degree of resorption of the right and left central incisor roots is shown by the radiograms in Fig. 12 (Case J) made two years after beginning treatment. A lingual appliance with auxiliary springs was used



Fig. 9.

Fig. 8.

upon the mandibular teeth. There has apparently been some resorption of the ends of the roots of these mandibular incisors.

The radiograms of (Case K) Figs. 13 and 14, are from an orthodontist on the Pacific Coast. These illustrate the importance of a correct interpretation before treatment is instituted. Fig. 13 is a radiogram of the maxillary incisors of a young man when he was twenty years of age. This radio-

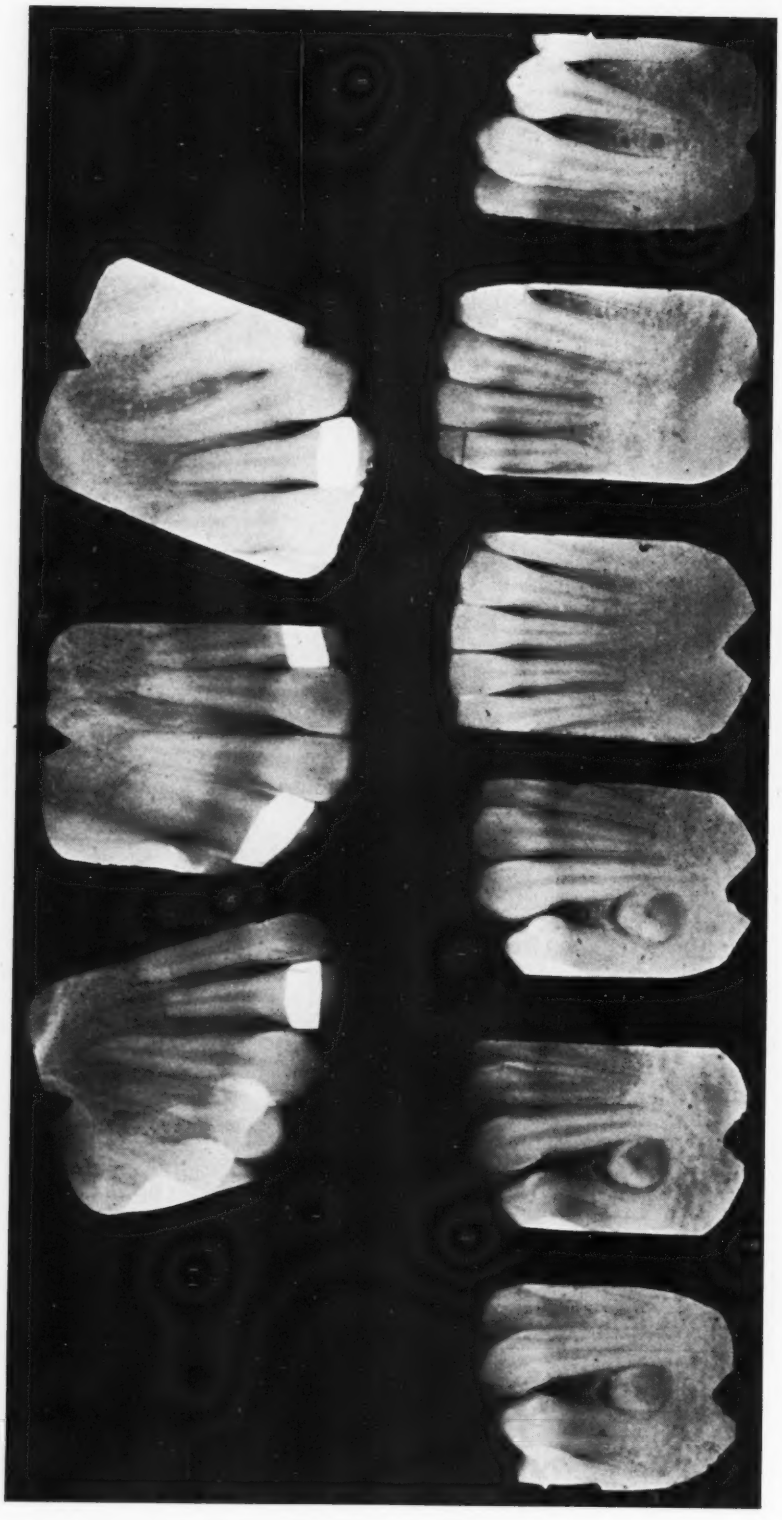


Fig. 10.

gram was made before any pressure was applied to the teeth in orthodontic treatment, although it shows the plain arch in place. Unfortunately the orthodontist did not notice that resorption of the maxillary central incisor root-ends was taking place before he started treatment.



Fig. 11.

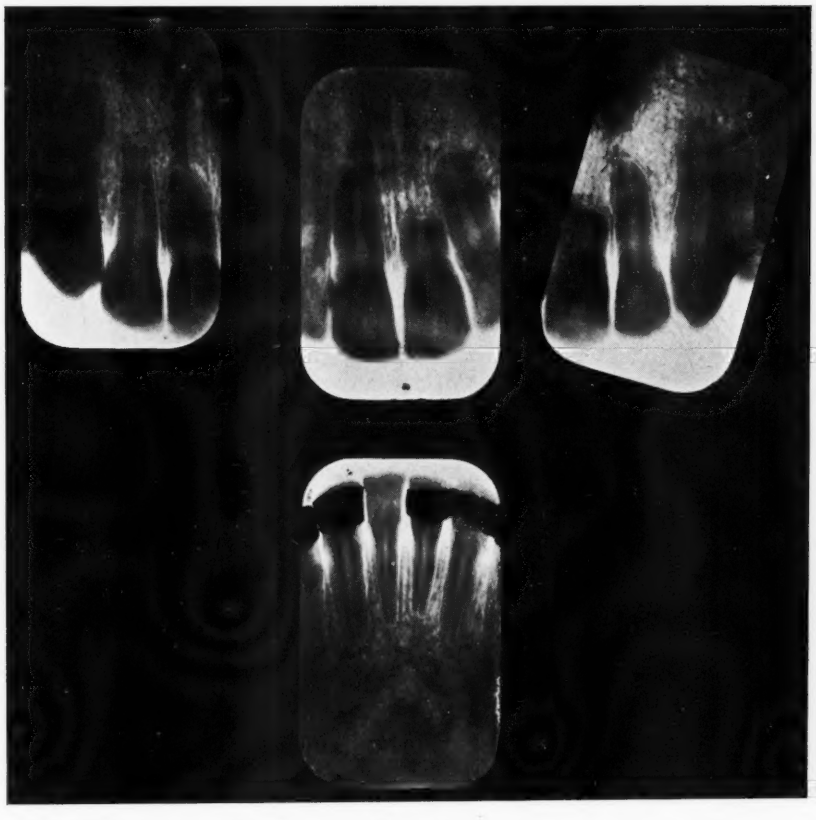


Fig. 12.

The second radiogram (Fig. 14, Case K) shows these teeth two years later. At the beginning of treatment the incisors were protruding, a plain arch resting in open tubes being used to move these teeth backward. No attachment except ligatures was made to the lateral incisors. One might think the incisors were foreshortened from the angle of the x-ray tube, being

higher than in the first radiogram, but measurements from the incisal ends of the centrals to the lower nasal border show the distance to be the same in each radiogram. However, as the angle of these incisors has been changed to one more nearly vertical through the orthodontic treatment the teeth are shortened in the second radiogram. The orthodontist writes as follows in regard to this case:

"You are welcome to use the x-rays of course but I would be *just as well pleased* not to have my name associated with the 'disgraceful affair.' I am not posing as a root amputator, and expect to do *less and less* in that line all the while now, so am not trying to advertise that *as a specialty.*"

Fig. 15 shows the radiograms of another case from the Pacific Coast. Unfortunately we do not have radiograms of the case before treatment. The orthodontist who sent the radiograms wrote as follows:



Fig. 13.

"You will find herewith a set of radiograms of great interest. The patient was a girl of fourteen when orthodontic treatment was started. Ribbon arches were used on both the upper and lower teeth, being left there for one year and four months. Just how long a time was required for actual tooth movement cannot be ascertained, but it was a short period."

Fig. 16 shows radiograms sent by an orthodontist on the Atlantic Coast, who gives a history of the case as follows:

"This boy had been under treatment by another orthodontist for a period of about three years when referred to me at the age of fifteen. It was a severe case of open bite with which both the former orthodontist and I struggled to keep from developing into a Class III, as well as endeavoring to overcome the severe open bite. Needless to say there were bracket-bands on the twelve anterior teeth. I have no history of any resorption of the mandibular incisors, but you will see ample indication of resorption of the

maxillary incisors. I desire also to call your attention to an apparent resorption of one root of each one of the mandibular first molars."

Diagnosis of resorptions of apical root-ends in the premolar and molar regions has sometimes been too obscure to permit of accurate interpretation, but that resorption is present in at least a small percentage of cases is shown by the radiogram on the right side in Fig. 17 (Case N).

VITALITY OF TEETH

What of the future of teeth having shortened root-ends? Dr. J. A. Gorman, in an excellent paper entitled "Importance of a Thorough X-Ray Examination Before Treatment," published in the May, 1926, issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY,



Fig. 14.

shows a picture of a lateral incisor with resorption apparently caused by an impacted canine, the pulp retaining its vitality, and the tooth being firm enough for use years after the malposition and impaction of the canine had been corrected.

The essayist had a similar experience twelve years ago in a patient seventeen years of age. The two upper radiograms in Fig. 18 (Case O) show both maxillary canines impacted. While the second radiogram of the left lateral incisor shows the root-end with an amputated appearance, apparently the left maxillary canine had either caused arrested development or resorption of the root-end of the left lateral. This lateral responded positively to tests for vitality. The case was treated. The right canine erupted after space was secured for it in the arch. The left canine was moved away from the end of the left lateral incisor root and into its normal place.

The radiograms made six years after treatment was completed are shown in Fig. 19 (Case O). Apparently the end of the left lateral incisor root has become rounded, whereas at the beginning it appeared to have been am-



Fig. 15.

putated. This lateral incisor today, twelve years after treatment, responds positively to tests for pulp vitality. It takes more than these few cases, however, to prove that the life and usefulness of these teeth with shortened roots have not been impaired.

RESORPTIONS—MAXILLARY VS. MANDIBULAR

This radiographic survey of 385 treated orthodontic patients shows definite resorptions of apical root-ends of some of the anterior teeth of eighty-two patients, or 21 per cent.

Resorptions in relation to the maxillary and mandibular teeth of these eighty-two patients were distributed as follows: Twenty-seven patients had resorptions of some of the apical root-ends of teeth in both maxillary and

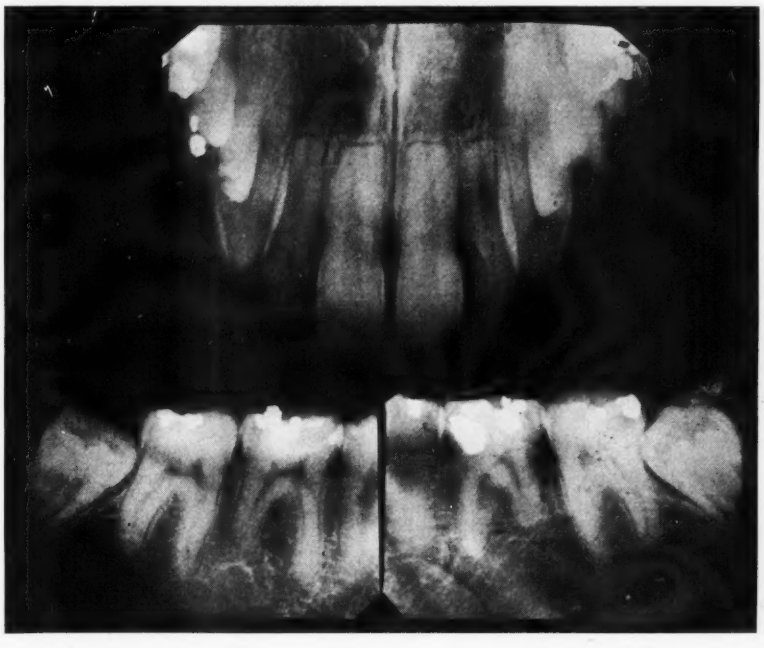


Fig. 16.

mandibular dental arches. Fifty-two had resorptions of the apical root-ends of some of the maxillary teeth, with no resorptions of the mandibular teeth. The remaining three showed resorptions of some of the teeth in the mandibular arch, without resorptions of the teeth in the maxillary arch.

There were resorptions of some of the teeth in the maxillary dental arch in seventy-nine patients out of the total of eighty-two having resorptions, or 96 per cent. There were resorptions of some of the teeth in the mandibular arch in thirty-one patients out of eighty-two, or 37 per cent.

The above indicates that the maxillary anterior teeth are more disposed to resorptions than the mandibular.

Perhaps the comparison of patients with identical appliances upon maxillary and mandibular teeth as given in Chart No. 1, Fig. 20, is more nearly correct. Of the total of thirty-two patients showing resorptions in this classification thirty had resorptions of some of the apical root-ends of the maxillary

teeth, or 93 per cent; while seventeen had resorptions of some of the apical root-ends of the mandibular teeth, or 53 per cent. This also indicates that the maxillary teeth are more disposed to resorptions than the mandibular.

RESORPTIONS—IDENTICAL APPLIANCES

A further analysis of Chart No. 1, Fig. 20, reveals that identical types of appliances were used upon both maxillary and mandibular teeth in the treat-



Fig. 17.



Fig. 18.

ment of 161 patients, and that the number of patients showing resorptions after treatment of the apical root-ends of some of the anterior teeth in either maxillary or mandibular dental arches, or in both was thirty-two, or 20 per cent. The number and type of appliances used and the number of patients whose teeth showed resorptions after treatment are shown to be as follows:

The pin and tube appliance was used to treat the maxillary and mandibular teeth of twelve patients, three of whom showed resorptions of the apical root-ends of some of the anterior teeth in both dental arches. One

showed resorption of apical root-ends of some of the mandibular anterior teeth without resorption of the maxillary teeth, making a total of four patients showing resorptions.

The ribbon and bracket appliance was used for the active period of treatment on both maxillary and mandibular teeth of forty-six patients, eleven of whom showed resorptions of apical root-ends of some of the anterior teeth in both maxillary and mandibular dental arches. Another eleven showed resorptions of some of the anterior maxillary tooth root-ends, without resorptions of the mandibular teeth. One showed resorption of some of the tooth root-ends in the mandibular arch, without showing resorption of the maxillary teeth, making a total of twenty-three patients out of the forty-six who had resorption of the roots of some of the anterior teeth.

The labial appliance was used for the active period of treatment upon the maxillary and mandibular teeth of forty-two patients, with no patient showing resorption of apical root-ends in both the maxillary and mandibular

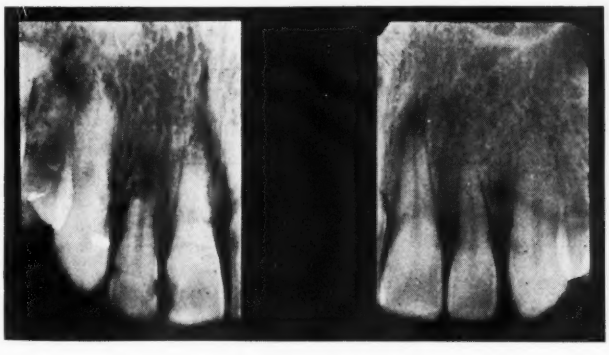


Fig. 19.

dental arches. Three patients showed resorption of the apical root-ends of some of the teeth in the maxillary arch without showing resorption in the mandibular arch.

The lingual appliance was used to treat the maxillary and mandibular teeth of sixty-one patients, with resorption of the apical root-ends of some of the teeth in both the maxillary and mandibular dental arches of one patient. One patient showed resorption of the maxillary anterior tooth root-ends without resorption of the mandibular teeth.

RESORPTIONS—DISSIMILAR APPLIANCES

Dissimilar types of appliances were used to treat the maxillary and mandibular teeth of 224 patients. Of these patients fifty, or 22 per cent, showed resorptions after treatment of the apical root-ends of some of the anterior teeth in either maxillary or mandibular dental arches or in both. These resorptions with the type and number of appliances are shown by Chart No. 2, Fig. 21, to be as follows:

The pin and tube appliance was used to treat the maxillary teeth of thirty-four patients, while the mandibular teeth were treated by other types of appliances as indicated by the Chart. Twelve patients are shown to have

had resorptions of the maxillary teeth and four of the mandibular teeth, or eight with resorptions of some of the maxillary teeth alone, and four with resorptions of both maxillary and mandibular teeth.

The ribbon-bracket appliance was used to treat the maxillary teeth of sixty-five patients, while the mandibular teeth were treated with other types of appliances as indicated by the Chart. Twenty-four patients are shown to have had resorptions of the maxillary teeth, and six of the mandibular, thus

CHART SHOWING
NUMBER OF PATIENTS
TREATED WITH IDENTICAL TYPES OF APPLIANCES
UPON MAXILLARY AND MANDIBULAR TEETH,
AND
NUMBER OF PATIENTS
SHOWING RESORPTIONS OF THE TEETH AFTER TREATMENT

TYPE OF APPLIANCE	NUMBER OF PATIENTS	NUMBER OF PATIENTS SHOWING RESORPTIONS			—TOTAL— NO. OF PATIENTS SHOWING RESORPTION
		MAXILLARY & MANDIBULAR	MAXILLARY ONLY	MANDIBULAR ONLY	
PIN & TUBE	12	3	0	1	4
RIBBON-BRACKET	46	11	11	1	23
LABIAL	42	0	3	0	3
LINGUAL	61	1	1	0	2
TOTAL NO. PATIENTS	161	15	15	2	32

CHART NO. 1
A.H.K.

Fig. 20.

eighteen had resorptions of the maxillary teeth alone, and six had resorptions of both maxillary and mandibular teeth.

The labial appliance was used to treat the maxillary teeth of 112 patients, while the mandibular teeth were treated by other types of appliances, as indicated by the Chart. Fourteen patients are shown by Chart to have had resorptions of the maxillary teeth, and four of the mandibular, but this is not correct for the one of the four showing resorption of the mandibular teeth and treated with the ribbon-bracket appliance upon these teeth did not have resorption of the maxillary teeth as shown, but had resorption of the mandibular teeth only. In order to avoid additional complications in the Chart this one case is classified as above. There were thirteen patients out of the

112 treated with the labial appliance upon the maxillary teeth showing resorptions of some of these teeth, and of the total of ninety patients who were treated with the lingual appliance upon the mandibular teeth three had resorptions of both maxillary and mandibular teeth.

The lingual appliance was used to treat the maxillary teeth of thirteen patients, while other types of appliances were used upon the mandibular teeth as shown by the Chart. None of these patients showed resorptions.

RESORPTIONS VS. APPLIANCES

Both charts, Figs. 20 and 21, show but few patients treated with the pin and tube appliance in comparison to the other types of appliances. After having made a radiographic examination of thirty-five treated orthodontic

CHART SHOWING

NUMBER OF PATIENTS TREATED WITH DISSIMILAR TYPES OF APPLIANCES UPON MAXILLARY AND MANDIBULAR TEETH, AND NUMBER OF PATIENTS SHOWING RESORPTIONS OF THE TEETH AFTER TREATMENT.

MAXILLARY				MANDIBULAR						
NUMBER OF PATIENTS TREATED	APPLIANCES		NO. OF PATIENTS WITH RESORP. OF MAXILL. TEETH	TYPE OF APPLIANCES					NO. OF PATIENTS WITH RESORP. OF MANDIB. TEETH	NUMBER OF PATIENTS TREATED
	TYPE	NUMBER		PIN & TUBE	RIBBON-BRACKET	LABIAL	LINGUAL	WITHOUT APPL'NCE		
34	PIN & TUBE	34	12	0	2	1	1	0	4	34
				0	3	11	18	2		
65	RIBBON-BRACKET	65	24	0	0	3	3	0	6	65
				0	0	10	55	0		
112	LABIAL	112	14	0	1	0	3	0	4	112
				2	7	0	90	13		
13	LINGUAL	13	0	0	0	0	0	0	0	13
				1	3	7	0	2		
TOTALS 224		224	50	0	3	4	7	0	14	TOTALS
				3	13	28	163	17		224

CHART NO. 2
A.H.K.

Fig. 21.

patients in succession, without finding evidence of tooth-root resorption, except slight evidence in one case, then the three cases following showing marked evidence, I realize that error is likely to result from a comparison of but few cases.

It has been shown that the maxillary teeth are more disposed to resorptions than the mandibular, hence the results of an analysis of the cases shown in Chart No. 2 cannot be justly indicated in terms of percentages. Therefore it is impossible to make an accurate comparison of one type of appliance and resorptions occurring during treatment, with any other type of appliance and resorptions occurring during its use.

CONCLUSIONS REACHED

It may be asked: Are these true resorptions or anatomic anomalies? That they are not anatomic anomalies is shown by the fact that radiograms made at the beginning of treatment show that there was normal root length, while those made at conclusion show that resorption has occurred.

It has also been shown in many cases under orthodontic treatment that definite root resorptions take place. Sometimes these resorptions occur in spite of painstaking care to eliminate factors which are supposed to be detrimental to the tissues involved. When one considers this carefully, the conclusion will be reached that there is something besides appliances involved in this problem. The essayist concludes that some people are more suspectible to disturbances during tooth movement than others, and that there may be an underlying cause or perhaps a hitherto unrecognized susceptibility to pathologic effects from mechanical stimuli.

Dr. Percy Howe, in a most excellent paper published in the *Dental Summary* for November, 1925, shows that through feeding monkeys a diet deficient in mineral salts and vitamines a condition of depletion of the lime salt content of the bones and of the teeth of the animal is produced, and the writer goes on to say:

"Hojer, in an excellent monograph on the subject, states that when *almost* enough of the antiscorbutic factor is furnished for the body requirements yet *not* enough, no pathology is to be found in the body *except in the teeth.* This represents a condition of latent antiscorbutic deficiency which often exists but that has been unrecognized."

Howe also states:

"We have teeth which *were* once *fully formed*, in which the *dentin* has become *nothing* but a softened mass."

When we consider the poorly balanced diet of the majority of our orthodontic patients, do we not have an insight into the underlying causes of resorptions of tooth-roots, namely, lack of lime salts or calcium starvation in greater or lesser degree, or faulty metabolism, with resultant susceptibility to tooth-root resorptions? It may be that extreme lack of development of the bones surrounding the roots of teeth, which often determined the selection of a root-moving appliance, is indicative of susceptibility on the part of the patient to tooth-root resorption.

However, was it just a *chance* that we had a high degree of susceptibility in fourteen out of fifty-eight patients upon whose teeth we placed pin and tube or ribbon and bracket appliances, upon *both* the maxillary and mandibular teeth?

Was it just chance that these fourteen had root resorption of both maxillary and mandibular teeth?

Was it just chance that we had a high degree of susceptibility in only one patient out of the 103 upon whom we placed plain labial or lingual appliances, upon both the maxillary and mandibular teeth?

Was it just chance that only one had a high degree of susceptibility, so that only this one had resorption of both maxillary and mandibular tooth root-ends?

After an analysis of the above findings, the essayist is of the opinion that the orthodontist must consider not only the predisposing susceptibility of the patient, but he must also consider the degree of immobility imparted to the teeth by the appliance. In other words, the orthodontist must consider

to what degree the appliance through immobilization interferes with the normal function of the teeth and for how long a period of time this interference continues.

In concluding this preliminary report the essayist urges all orthodontists to secure accurate radiographic surveys of all patients before treatment, and then to recheck often, compiling results so that a large amount of accurate data may be secured.

DISCUSSION

Dr. Rodrigues Ottolengui, New York.—I have read Dr. Ketcham's paper several times, and I consider it an important contribution to the knowledge of the conditions investigated. I believe that I had the honor of presenting the first serious paper dealing with this topic. This communication was entitled "The Physiological and Pathological Resorption of Tooth Roots," was read before the American Society of Orthodontists, at Chicago, July, 1913, and was published in *Items of Interest*,* for May, 1914, and in the Transactions of that Society.

After carefully studying Dr. Ketcham's paper I was tempted to undertake an analytical discussion of the various points that he has raised, but I deemed it wise first to read again my own paper (above referred to), and having done so I find that at that time I rather fully expressed views that I have not as yet found reason to alter. As it is easily obtainable, those who wish to do so may consult the original, and at this time I shall confine myself to the expression of additional and newer views based upon evidence which has since come into my possession.

As an introduction to this discussion, and for the benefit of those who may not wish to look up the original paper, let me state that on Oct. 8, 1910, noticing what seemed to be unusual looseness of the mandibular central incisors, in the mouth of a girl ten years of age, who had been under orthodontic treatment for a little over a year, I sent the patient to Dr. Schamberg for a radiographic examination, not at the time having an x-ray machine. Figs. 1, 2, and 3, show the condition found, and these are from the same films used for Figs. 1, 2, and 3 of the original paper.

As I had no radiograms of the case prior to treatment, it was impossible to determine positively whether the roots of these central incisors had once been fully formed, and had then been resorbed; whether it was a case of arrest of development, which, as we shall presently see, must be considered; or whether they were blunt-ended, short roots, as seen in several of Dr. Ketcham's illustrations.

Naturally, the dread in my own mind was that the roots had once been of full normal length and that during my treatment of the case resorption had occurred.

In Dr. Ketcham's paper he leaves no doubt that absorption may occur during orthodontic treatment, because in several instances he furnishes radiographs of teeth with fully formed apices, which later have disappeared. I deduce from the general trend of Dr. Ketcham's paper that he believes that the resorption of the ends of these roots was directly due to orthodontic treatment, unwisely or too vigorously administered.

It is a strange fact that often, after listening to the arguments of counsel in some great criminal trial, one becomes quite convinced of the guilt of the accused; and then, after hearing the response in behalf of the defense, he is forced to believe that the prisoner is not guilty, or at least, that his guilt has not been proved, "beyond all doubt," as the law requires. Following the analogy, let me appear as the advocate for the orthodontist.

Long before we began to think of the resorption of tooth roots during orthodontic treatment, we were often compelled to consider the question as to whether or not our treatment was responsible for the death of a pulp. And it may not be amiss to point out that just as these root-end resorptions appear to be confined to the incisor region, so also has it been with death of pulps, though occasionally reports of pulp death in cuspids have been reported.

*The name of this magazine has since been changed to *Dental Items of Interest*. Those wishing to consult this work in their library should bear this fact in mind.

In considering the matter of death of pulps during treatment I ask myself, "Do pulps die in teeth which have not been under treatment? And if so from what cause?" And the answer of course is, that pulps in children's anterior teeth often die because of traumatic injury. From this it is an easy stage of argument to say: "If a pulp in a normal tooth may die because of a blow, why may it not be that the pulp in a tooth under orthodontic treatment may die from a similar cause?" And the answer to this is that not only may a tooth under treatment receive a blow that would cause its death, but the very fact that it is already somewhat disturbed because of the treatment, might render the pulp much more easily injured. The blow might be one that the child might not even notice. It is even conceivable that the sudden concussion of bringing the teeth together through some hard substance, such as hard candy, might suffice to induce death of the pulp. A case from practice will emphasize this argument.



Fig. 1.



Fig. 2.



Fig. 3.

A girl of twelve was in my care many years ago, when we had only crude appliances, such as wire arches, and rubber ligatures for "rotating" teeth, and all was going to my satisfaction, when at one visit I noticed a slight difference in color of one central incisor. Suspecting pulp involvement I asked, "Have you had a blow on this tooth?" to which the reply was in the negative. I sent for the child's mother, and expressed my opinion that the pulp was dead or dying, and that the tooth should be opened at once and the pulp removed. The mother could not see any difference in the color of the tooth, and declined to permit me to drill into the pulp. As it was nearing the summer season, I stopped treatment, placed retainers and dismissed the case till autumn.

In the following October the mother came in, thoroughly convinced that the pulp had died, because the tooth was "turning black" (it really was only a little darker than when previously seen), and, of more interest to us, is the fact that by discussing the matter at home a younger brother recalled that he had struck his sister in the mouth with a toy trumpet.

The pulp canal was opened (this was prior to my possession of a radiographic outfit) and I found the canal densely packed with calcific material so that several sittings were required to reach anywhere near the root-end. The reader will please remember this statement in connection with a radiogram to be presented presently. (See Case 3, Fig. 7.)

Now then what is the argument in relation to root-end resorption?

The argument is that cases are on record where radiograms taken prior to treatment show the ends of the incisor roots fully formed; then radiograms taken after treatment show evidences of root-end resorption, the pulps remaining alive. And the deduction is that some factor of treatment, either the rapidity of tooth movement, too great a degree of stress against the root-end, or some other detail, has been the direct cause of inaugurating the root-end resorption.

If we can show that just as pulps may die from trauma, regardless of whether orthodontic treatment is in progress or not, so likewise trauma may cause root-end resorption where no orthodontic treatment has occurred, it seems to me that we raise the very proper question, "Was the resorption due to orthodontic treatment wrongly applied, or was it due to some blow, or other traumatic disturbance occurring during treatment, the tooth at such period being much more susceptible to injury? Along these lines I take pleasure in presenting a few case histories:



Fig. 4.

Case 1.—Fig. 4 is from a radiogram of a case in the practice of Dr. Lester R. Cahn, and is kindly supplied by him. The patient was a woman thirty-three years of age. She recalls receiving a blow by falling, when she was nine or ten years of age. Both mandibular incisors became "sore and a little loose for a time," to quote her words. Later, they appeared normal and remained so until three or four years ago, when both teeth began to discolor. One was removed two years ago, and the one here shown (Fig. 4) was extracted by Dr. Cahn recently. It proved to have a dead pulp and a cystic granuloma at the apex.

This case, even without further evidence, discloses that a blow may cause arrest of development of a forming tooth, and that the pulp may nevertheless remain alive for many years. There never was any orthodontic treatment.

If there is any doubt that development of a forming tooth may be arrested, and the pulp remain alive, the following case must dissipate such skepticism.

Case 2.—The radiograms (Figs. 5 and 6) have been kindly given to me by Prof. Joseph Schroff. Unfortunately the patient was not seen by Dr. Schroff, and no radiogram was taken prior to extraction. The tooth was removed to make room for an artificial denture. It was sent to Dr. Schroff, pathologist, because of its peculiar appearance. The tooth is seemingly the tooth of a child of from six to ten years of age, but the patient was fifty-five years old. The pulp was alive at the time of extraction. The patient thinks that he had a fall that loosened this tooth when he was a child. Unfortunately the history is somewhat vague, but the tooth speaks for itself. Something arrested the development of this tooth. Resorption might have destroyed its apex, and probably has done so to a slight extent, but the fact that the pulp was alive shows that the canal could not have been enlarged, to the extent seen, by

any resorptive process. The probability is that a blow arrested the development of this tooth at about the age of eight; yet the pulp remained alive for more than forty years longer. It may seem that this has no bearing on Dr. Ketcham's topic, but it really has. It demonstrates the remarkable vitality of tooth pulps, and that even when suffering from traumatic injury, the pulp may remain alive indefinitely. Thus the presumable damage done to teeth, where resorption destroys the apex, without devitalizing the pulp, is shown to be more presumptive than real. I shall present further evidence along this line later on.

CASE 3.—All doubts that may linger about the last case are removed when we examine Fig. 7. This radiogram was supplied by the courtesy of Dr. Adolph Berger. The teeth have not as yet been extracted, and possibly may not be. The patient is a man fifty-one years of age. He states that during childhood he fell and struck these teeth on the sidewalk. They became slightly loose and remained so for a few days.

This case is most extraordinary and demonstrates how little we really know of the reaction of teeth to traumatic injuries. Here are two central incisors, injured in the same manner and at the same time. In one we find a complete arrest of development, the root resembling a tooth at the age of eight or ten. In the adjacent tooth, development seems to have been stimulated to such an extent that not only has the canal been narrowed in the normal ratio, but seemingly, deposition of dentin or other calcific material has completely



Fig. 5.



Fig. 6.

obliterated the canal. The teeth are slightly discolored, but the one with the undeveloped root appears to be alive. There never was any orthodontic treatment in this case.

CASE 4.—Fig. 8* brings us to a condition which accurately matches several of the radiograms in Dr. Ketcham's paper. The radiogram and case history were kindly supplied by Dr. Edwin Nestler. The patient is a woman forty-one years of age. No orthodontic treatment has ever occurred. The appearance of the root-ends, however, indicate absorption, but the pulps are alive.

CASE 5.—Fig. 9 is from a radiogram sent to me a few years ago by a colleague, for an opinion. There is distinct pathologic resorption about the root-end of the lateral incisor, due probably to a dying or dead pulp. Note the filling in the palatal surface. But what of the central incisor, the cuspid and the bicuspid? All of these appear to have lost their apices without the aid of an orthodontist, since no orthodontic treatment had occurred.

Whilst arguing that radical disturbances may occur in young teeth, due to trauma, I do not at all wish to insinuate that orthodontic treatment may not at times be a factor in inaugurating root absorption. After all, whilst properly applied orthodontic forces can scarcely be called "traumatic" in character, there is no doubt that force exerted in too great a degree might very well be accounted as traumatic. For example, the very slow drawing down of a cuspid tooth, with properly applied traction by means of ligatures or springs,

*In regard to Fig. 8, the description of the case was written from a lantern slide taken five years ago. Unfortunately the original film was lost. The radiogram used for illustration was taken in November, 1926, especially for this article. Since last seen the patient has developed periodontoclasia which has destroyed the septum between the incisors, but the roots of the teeth have not changed. R. O.

cannot cause trauma. On the other hand the "immediate regulation" of such teeth, by drawing them down with a pair of forceps, and even rotating at the same time, as was once advocated, must necessarily affect the pulp, and injure the pericemental attachment. Evidently therefore such method would be traumatic in effect. Somewhere between the rapid and the slow movement of teeth, exists the line of demarcation between trauma and treatment.

The point I wish to make is that these interferences with development, and these root-end resorptions are the results of trauma, whether caused by external blows, or by wrongly applied orthodontic stresses. Each case, therefore, is a case by itself, and it must not be forgotten that although root resorption may occur during orthodontic treatment, it may really be caused by trauma instituted by other forces, and that the injury may originate in a blow or concussion that is so slight that it may well be forgotten by the patient.

The following extraordinary case history is introduced because it shows resorption from a different type of trauma.

CASE 6.—Figs. 10, 11, and 12, are from radiograms kindly supplied by Dr. Hillel Feldman. The patient had a fixed bridge placed for her sixteen years ago, fastened at one end to a sound, healthy second molar, and at the other to a living bicuspid. Within the past few months the bridge appeared to be loose, and her dentist sent her to Dr. Feldman for



Fig. 7.

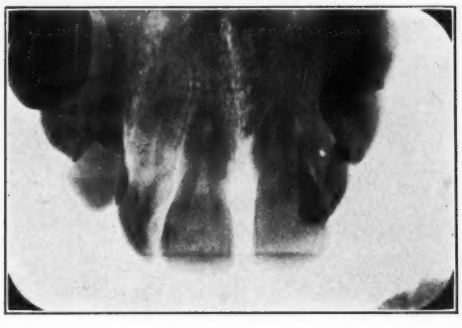


Fig. 8.



Fig. 9.

radiographic examination. In Fig. 10, we note the complete disappearance of the molar and the filling in of its socket with new bone. The gold shell crown has been worn through on its occlusal surface, and the tooth crown evidently became carious, because at present it also has completely vanished. The patient reports that for some months little pieces of tooth have been coming out from under the crown. As to the causes of this extraordinary condition we can only speculate, but we have some very good arguments on which to base a deduction. The first question naturally would be: "Did the crown of the tooth disappear first as a result of caries, or was the root destroyed first by resorption?" Evidently the root was resorbed first. Had the crown been removed first, the bridge would have become apparently loose while the root was still present. This sort of destruction of crowns under bridges is far from uncommon. It is fair to presume then that the root was slowly resorbed and the socket built in with bone, until whatever was left of the carious crown at that time was resting only upon the soft tissue, which still afforded a quasi support until the final pieces of the decaying crown came away. Whether this root resorption was inaugurated by the death of the pulp, or by inordinate stresses transmitted through the fixed bridge, is a question that might be argued in one way by the pathodontist and contrarily by those bridgeworkers who claim that all fixed bridgework is a menace to the environmental tissues of the abutment teeth.

Fig. 10 brings us additional evidence for consideration. This shows the bicuspid which served as the anterior abutment. This pulp was still living at the time the radiogram was taken, yet the root-end is being resorbed. Apparently the loss of the support of the distal

abutment has caused inordinate stresses against this root tip, and, acting traumatically, these forces have inagurated the root-end resorption.

Fig. 12 is of only passing interest, and would not be shown except that it is a further view of the same case. In Fig. 11, a mysterious radiopaque object is seen lying at the tip of the lateral incisor, in Fig. 12, this is shown to be an unerupted cuspid, and we note also that the tip of the lateral incisor has not been resorbed, which perhaps is contrary to what one might rightfully expect, in this mouth.



Fig. 10.



Fig. 11.



Fig. 12.



Fig. 13.



Fig. 14.



Fig. 15.

A question of vital interest to both orthodontist and patient would read as follows: "To what extent is a tooth damaged by the resorption of its root-end?"

We have already recited instances where teeth have been retained indefinitely after injuries received during childhood, and while these are congeneric to our general subject, let me report that the patient whose resorbed roots are shown in Figs. 1, 2, and 3, was in my office about two years ago. Unfortunately her visit was very brief. Indeed she was just passing through the city, and stopped in to say to me, "I still have my front teeth." I had no opportunity to take radiograms but a digital examination showed the teeth to be quite firm, while their color indicated that the pulps were yet alive.

In order to obtain more definite evidence along this line I have sought for a new radiographic record of one of the cases reported in my original paper, and Dr. J. Lowe Young has kindly procured this for me.

Fig. 13 is from a radiographic print of the identical film used for Fig. 4 of my original paper. Figs. 14 and 15, viewed together, show the same area, and are reproduced from films taken by Dr. Young, October 26, 1926. Oddly enough the first radiogram of this case was taken October 26, 1909. Consequently these teeth, in spite of the apical resorption have remained alive and have functioned without further loss of their roots for seventeen years.

Dr. John Albert Marshall, San Francisco.—As I am not an orthodontist, but a guest who is interested in some of the problems of the orthodontist, I feel that I may be pardoned for not discussing the relative merits, or demerits, as the case may be, of the different types of appliances. I will confine what few remarks I have to offer, therefore, to some of the other questions which have arisen in my mind while listening to Dr. Ketcham's paper.

In the first place is this resorption which Dr. Ketcham mentions physiologic or pathologic? The radiograph does not differentiate. There is no definite proof in either direction, and since reasoning by analogy is fallacious it is necessary that the available data be correlated and compared with the various theories dealing with apical resorptions.

The normal shedding of deciduous teeth is an example of physiologic resorption, and one of the explanations which is offered for such a process, is this: the pressure of the underlying bone produces pressure atrophy of the alveolar wall and peridental membrane, and the tooth is lost. But if this be so how do you explain the fact that deciduous teeth are shed when there are no permanent teeth beneath them? There is no pressure atrophy there. So much for the first theory.

The second theory says: That as a result of a stimulus, perhaps, a normal growth stimulus in the individual's jaw—at any rate as a result of some stimulus which we can't define, there is lactic acid produced! What a remarkable statement to make. One of the most constant things in our whole human economy is the control of acidity and alkalinity within the body. We have certain substances in the blood stream that control acidity. When it is realized that the concentration of actual acid (H) in the blood, normally, is 32 in the eighth decimal place (0.00000032) and if the 32 is changed to 34 in the eighth decimal place, the individual is out of breath; you will see how tremendously delicate is this balance of acid in the system. So, it seems that this theory is not based on biochemical facts.

The third theory, perhaps, is the most acceptable. The various French histologists assume that the resorption of deciduous roots, in fact resorption in general, is a modified osteitis. In other words, that there is an *inflammation* of the bone which has decreased its density. However, since resorption is not entirely pathologic, but occurs physiologically under certain conditions, the term "osteitis" is a misnomer. It is not an inflammation of the bone in the sense that the term is ordinarily understood. None of these theories explain the "what" and "why" of resorption. This is one point of departure for a research problem.

Whichever theory may be accepted for an explanation of apical resorption, it is obvious that apical infection cannot be entirely ruled out. It may have been brought to the locality from the gingival crevice by way of the peridental membrane. And this suggests another question. What relationship exists between oral cleanliness and apical resorption? Is it true, for example, that the greater the mouth filth the greater the resorption, or does there appear to be any relationship whatever?

The second avenue of infection other than the peridental membrane is the pulp, but in this case the symptoms of pulp disturbance are usually much more severe than in the first instance. Finally there is the possibility of infection from adjacent teeth or sinuses.

There is another angle of the problem which deals with the function of the peridental membrane, and the interference in function which may occur as a result of orthodontic appliances. Although the peridental membrane is in certain respects entirely analogous to periosteum of bone, there is this important difference: in periosteum the fibers are attached on one side to *hard* tissue and on the other, to *soft* tissue. But in peridental membrane lying apically from the alveolar crest particularly the apical portion, the fibers on ***both*** sides of

the membrane are attached to *hard* tissue. Any undue stresses may give rise to a trauma which has as its eventual result, the activation of the modified osteoclast, the cementoclast. Its activity is thought to produce apical resorption. These stresses are the result of undue pressure such as may occur from an orthodontic appliance. In this connection, however, may I point out that immobility does not occur in living cells. The very expression of life is movement. Is it entirely correct to construct appliances which enforce *immobility* of a part? In so far as resorption itself is concerned, it is apparent that we are still seeking an explanation for the process. Our present hypotheses are these: First, that it may be the indirect result of some force injudiciously applied or maintained. Second, that it may be the result of a general growth wave. Third, that it may be the expression of a chronic inflammation induced by an infection.

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Finally, may I point out that the term immobility is relative only. It would seem from the results of Dr. Ketcham's inquiry that some types of appliances are more apt to produce apical resorption than others. It would be interesting to know how many have observed the same results with the same appliances as have been described today. One of the most important effects of Dr. Ketcham's paper will be to stimulate the spirit of inquiry, and to plan, to perform, and to complete some research problem.

Why is it that the most empirical dental specialty does so little toward the fostering or financing of research. It is quite needless to say that your results are usually satisfactory, but are they *always* entirely so? If they are, then you have reached the millennium.

Dr. Harry A. Allhouse.—I do not feel at all capable of discussing a paper of this magnitude, but I do want to say a word of commendation for Dr. Ketcham for having prepared this splendid paper. We can readily see that it has taken months of untiring work and incidentally considerable expense to prepare, and I feel it has opened one of our most important problems for deep and considered investigation.

I want to show some radiograms of a patient presenting himself for continued treatment the day before I left for this meeting. (Fig. 1.)

They are of a girl fifteen years of age and about as healthy and athletic a specimen as you would ever find. She has been under treatment for three years. These slides are not very good. They were taken and mailed to me Tuesday. She came with molar bands and soldered retainer attached to canine bands by spurs for support. The molars and premolars were in very good occlusion, but the anteriors were in complete nonocclusion, the incisors showing a slightly relapsed condition.

I am only showing this to get a little information and emphasize the importance of frequent radiograms taken. I do not believe an orthodontist treating this case had any idea of this condition. Let us have our cases radiographed more frequently and not let the other fellow worry over our mistakes.

President Fisher.—Is there further discussion of this paper or have any of you questions to ask Dr. Ketcham?

Dr. Gorman, New Orleans.—Since arriving here, I had the good luck to find that Dr. Ketcham had one or two of my slides and he threw them out, so I want to throw them on the screen if you can see them. (Figs. 1, 2 and 3.)

I want to say that it is not only on the Pacific Coast or the Atlantic Coast or in the mountains that we have resorption; but way down in Louisiana we have resorption of root-ends as well.

Dr. Federspiel, Milwaukee.—I am very much interested in Dr. Ketcham's paper and also in the remarks by Dr. Marshall. Persistent irritation will frequently cause a breaking down of the cellular elements that make up tissue. The persistent irritation caused by the growth of a follicular cyst in a jaw breaks down the surrounding bone to make way for the



Fig. 1. (Allshouse.)

constant growth of the mass. Resorption is the end-result of persistent irritation. Old chronic inflammatory areas, if continuous in their inflammatory irritation, stimulate the bone to a sclerotic formation. In other words, bone sclerosis is caused by persistent irritation. Root ends of teeth may be absorbed by a slow chronic infection. This infection produces sufficient irritation to break down the cellular elements that make up the root ends.

Let us not forget that appliances are either continuous in their pressure or interrupted. Continuous pressure is a persistent irritation and causes resorption. The interrupted appliance is not persistent, and it is, therefore, interesting for those who carry on orthodontic problems to study the end-results of interrupted and persistent treatment.

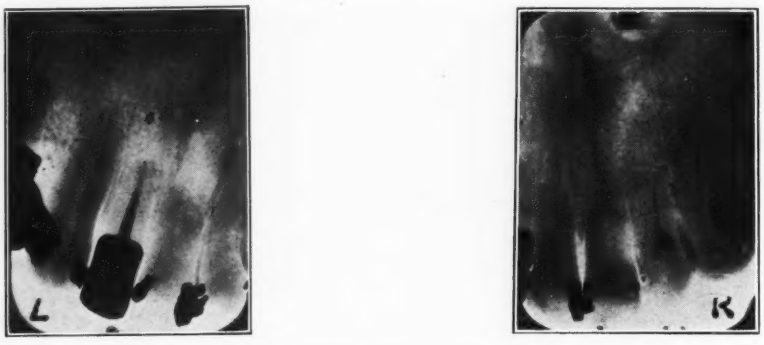


Fig. 1.—B. T. M. 5-19-21. Two views of four anterior teeth of a man about forty-five years of age. Had his teeth "straightened" when about fourteen years of age. He says teeth were very badly rotated. Note absorption of root-ends. Both centrals seemed vital. (Gorman.)

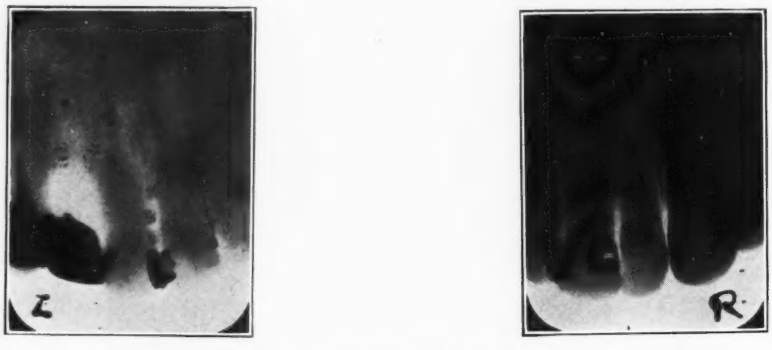


Fig. 2.—B. T. M. 11-27-25. Same patient as Fig. 1, four years later after loss of left lateral. About same amount of absorption of root-ends of centrals. (Gorman.)



Fig. 3.—Two views of same patient. Note absorption of the root-ends of left central and both laterals. The right central was in infraocclusion. Was never able to move it and it has never elongated. Note also the indistinctness of root of same. (Gorman.)

Dr. Milo Hellman.—The problem that Dr. Ketcham has brought up before us is, I think, one of the most intensely interesting, but I fear that in order that we may not be running amuck it is necessary to distinguish between several fundamental facts that enter into this complex.

In the first place, we must not forget that we have to deal with a phenomenon of resorption which in itself is very complicated and unexplainable. Secondly, we have a problem

of appliances which Dr. Ketcham has brought into connection with this. Thirdly, we have the problem of pathology.

I would say that before the pathologic problem is attacked at all, we should pay more attention to the connection between appliances and resorption. It seems, in the first place, that resorption may take place with or without appliances. Secondly, we note, as in Dr. Ketcham's presentation, that appliances differ and the percentage of absorption differs with the kind of appliance, but that is not the main problem at issue. It is not the kind of appliance that has really any connection with the character of resorption; it is what the appliance does that may be brought into connection with this phenomenon. The number of appliances as compared with resorption may also be explained on a different basis.

For instance, the lingual appliance being the latest is applied least. The plain labial arch which is the oldest and not considered as the most modern is next applied least. The pin and tube and the ribbon arch are very modern, and everybody wishing to be in style certainly uses them. Another thing is that since the appearance of the pin and tube and ribbon arch appliances, there has been also an increase in the number of men who use them. Therefore, we may say that the fact brought out by Dr. Ketcham as to the relationship between the number of these particular appliances and the increase in percentage of resorption may have an entirely different aspect than really the cause of it.

I would say that in order to get light on this topic it would be necessary to investigate this problem all over again and take these factors into consideration. For a scientific problem to be definitely decided upon, it would be necessary, for instance, for the same man to use the different appliances on different occasions and to know just exactly whether each appliance does something or does not do anything. For instance, some blame the inactivity of the pin and ribbon or bracket appliance; others blame it for the overactivity. We do not know which is right. We may say the same thing—perhaps the reason the lingual arch does not cause any resorption is because it does not do anything. Perhaps the other does everything and does too much. I mean there are so many phases of this subject to be considered if we wish to get at the real scientific solution of this particular problem.

Dr. Grieve, Toronto.—A very important fact I think that Dr. Ketcham has mentioned is possible susceptibility, showing a variation in the degree of resorption in different individuals. I have no scientific statements or any statements to make founded on science, but the fact that we find so little resorption where the lingual arch is used is an indication to me that the force is not so direct. I feel that a great many men are using light auxiliary springs for their actual movement with the lingual arch, and the other appliances are more fixed, such as the pin appliance and the ribbon arch.

I think, too, from what observations I have made of my own cases, that I find more resorption on incisors than I do on the other teeth, and that seems to be evident from the slides which Dr. Ketcham has shown.

It is not the result of scientific investigation at all on my part, but only a thought that where we have a fixed appliance upon teeth, the appliance being tightened up, whether it be the ribbon arch, tightening up the nuts in front of the molars, or whether it be the pin appliance, or any force that we may apply, the incisors offer the least resistance; consequently, they bear the greatest brunt of any force which is applied by the appliance.

I have, as I have said before, found that the resorption is greater on the incisors, and often I feel that the incisors, which in many instances occupy a position too far labial and are beyond what Lundstrom has called the apical base, offer less resistance; consequently they bear the brunt of the strain which is put on.

I believe that resorption—it is only a theory—may be due to the fact of too great a stimulation, that if in the movement of teeth we will, as far as possible, confine our activities to light spring force of very delicate wire, having plenty of resistance spread around the different teeth so that we do not get a thrust against any of the teeth, so that those that

are to be moved are moved with a light spring force, I am inclined to think we are going to have less resorption.

As I spoke of the apical base, lots of these incisors are already standing beyond the apical base when we start our treatment and they are carried out beyond the main body of the bone. They have not the tissue beneath them to stand the resistance, or the base upon which to stand, and consquently they are the teeth which suffer.

I believe that if we utilize a great many of the teeth as anchorage, and use delicate springs to accomplish the bulk of the movement, we will be less liable to have resorption.

President Fisher.—I ask the privilege of stepping out of the chair for the only time during the session to speak on a paper. It is quite unparliamentary, I will admit, but I hope you will indulge me this once.

Most of this discussion of the resorption of roots has been on anterior teeth. Dr. Ketcham showed this slide—and I must admit that it is from my own practice—in which you will notice that the posterior roots of the anchored teeth, the mandibular molar, show vast resorption. We have had a lot of theorizing as to what causes resorption of the anterior roots. Will the man who thinks he can answer that please tell me why one root of my anchored molar absorbed and the other one did not? Does the posterior root receive any greater pressure in anchorage than the anterior root? I would like to know.

Question.—Did you have a radiograph of that tooth before you started treatment?

President Fisher.—No. That was a referred case that was under orthodontic treatment for nearly three years before it came to me. I am willing to admit that it was under orthodontic treatment with me for nearly three years before we got anything like a satisfactory result.

I feel very sure, that there could not have been any resorption of that root prior. Have you ever seen a six-year molar or any molar with one root absorbed and the other not where there has not been pathology?

Dr. C. A. Hawley, Washington, D. C.—There is one point in this problem that has not been mentioned by Dr. Ketcham or by any other discussor so far. The result of this investigation clearly indicates that more resorptions occur when the pin and tube or the ribbon arch is used. Dr. Ketcham suggests that it may be due to their greater fixation; that the teeth are held too rigidly. It must be remembered, however, that these are the only two appliances investigated in which positive root movement is possible—movement of roots at their apices. Perhaps this is where the risk lies. Also in these appliances root movement is started at the same time and simultaneously with lingual or labial movement and rotation. Perhaps this combination of movements is dangerous. In either case patients should be distinctly informed that such movement involves some risk and it is a risk that cannot be foreseen by the operator. If the case is such that that kind of movement is the only one by which the best results can be obtained, the patient should be informed that such a risk is involved.

Dr. A. H. Ketcham (closing).—In closing I shall consume but little time. First, I shall again urge all to x-ray orthodontic patients before treatment, and after treatment has progressed six to eight months, repeat the x-ray check-up every few months in order to discover resorptions when they first begin, so that tooth movement may be modified accordingly. Now, if you do not have radiograms, in this day of almost universal use of the x-ray, some one else is going to x-ray your patients and find tooth root resorptions in some. Would it not be better for you to make the explanation that these resorptions sometimes occur, rather than have the other fellow do it. You may be a little more diplomatic.

Before starting treatment, besides full mouth x-ray, we may be obliged to elicit the aid of the biochemist and the internist. It is a serious thing to treat malocclusions and then find the patient has resorbed tooth roots.

Dr. Hawley's suggestion is timely, that in cases where extensive tooth root movement is indicated, the patients should be distinctly informed that some risk is involved. Perhaps our knowledge of diagnosis may become so perfected that we may be able to detect susceptibility before treatment.

I thank you, gentlemen, for your kind reception of this paper; I expected criticism, because it affects every orthodontist. The investigation has taken my ego down very much, perhaps this is a good thing. I want to thank those who have discussed the paper. They have thrown a great deal of light upon the problem.

I must also express my appreciation to Drs. John Marshall, Harvey Stallard, A. LeRoy Johnson and Milo Hellman for their help in preparing the text of this paper, and also to many others for valuable material sent me.

THE SELF-CORRECTION OF ORTHODONTIC ANOMALIES*

By Prof. Dr. Kantorowicz, Bonn, Germany

TO A real investigation of the anomalies of the position of the teeth, speculative thinking may prepare the way, yet nothing but observation and experiments can procure certain and well-founded information. Observation is made difficult by the long duration an anomaly takes in developing—in many cases several years. Experiments can only be used to a modest degree, as they are intentionally caused exceptions to the normal functions of life, the objects of which are human beings.

And yet the whole future of etiologic investigation is dependent on these two methods. The conviction of this fact has led me to collect an extensive series of observations concerning the origin of anomalies. In the Dental School Clinic of the town of Bonn, we take casts of the teeth of about 150 children, who at six years of age may be suspected of developing anomalies or whose existing anomalies may be expected to grow worse. At the end of every year all cases which lack importance are singled out and others taken instead. Thus, we get a series of casts which provides us with a unique collection of observations concerning the most disputed question. We are able to observe the origin of an anomaly, as it were, comparable only to a scene in the movies, although the study of the processes of growth asks for minute observation and exact taking of measurements. I need not explain that in none of the cases referred to here, any orthodontic operation took place.

I further want to mention that we apply the same kind of observation, not only from the sixth to the fourteenth years of life, but also during the very first years of infancy, beginning (so to say) from the day of birth, a task which is entrusted to my assistant, Dr. Korkhaus. Also, in these cases, we have arrived at remarkable conclusions, about which, however, we shall not be able to report until next year. The time from the second to the fourth years of life has also been investigated, during which time quite a series of anomalies has been observed to originate, and has led towards an explanation. This investigation appeared in print some weeks ago.

In order to make it possible for you to understand the plaster casts I am going to show, I have to remind you of some physiologic processes. In this society of specialists I need only to point out that the milk molars have a longer mesiodistal diameter than the premolars, and that, therefore, during the eruption of the premolars the first molars move forward in the upper, as well as in the lower jaw (about 2 mm.) until the premolars touch their points of contact. Besides, I want to remind you of the fact that the first molars (in about 50 per cent of all cases) come out in an indefinite or uncertain occlusion; that is, in an edge and edge bite. Only after the eruption of the front teeth the normal fissure-bite originates by a trifling moving for-

*Read before the First International Orthodontic Congress, New York City, August 16-20, 1926.

ward of the lower jaw into the curve of the upper front teeth which grows larger above than below.

More important for the knowledge of anomalies are certain impediments of growth, which have their origin in premature extraction of teeth. These have been described for the first time by Angle and Grunberg, yet their lawful development has not yet been described with a precision sufficient for the understanding of the origin of anomalies.

There are two things which determine the growth of the jaws: (1) The existence of teeth; and (2) a force of growth, which cannot yet be explained and which does not become more plausible by our using the well-known phenomenon of the endocrine glands as an explanation. From the age of two years and a half, the jaws grow in length as much each time as new teeth

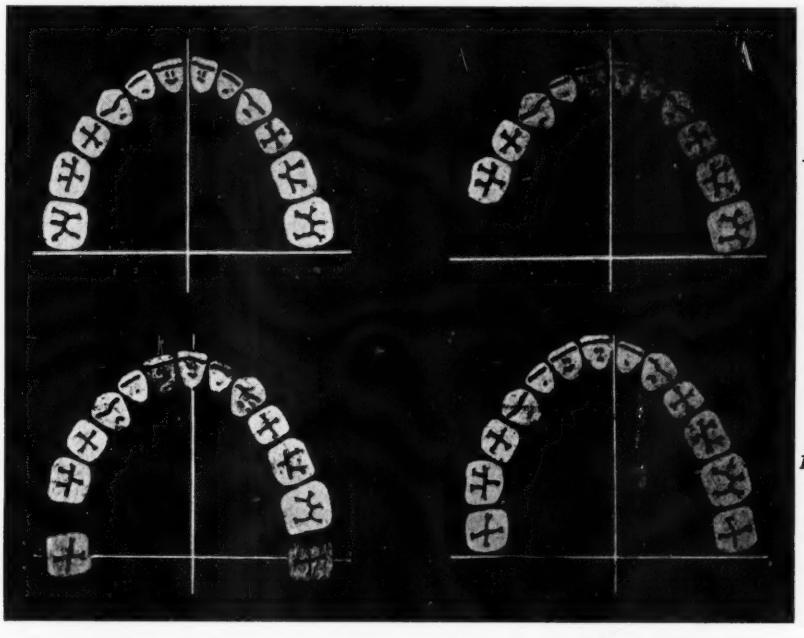


Fig. 1.—Schematic drawing of the results of the extraction of the first molar at the age of six. *A*, Maxillary jaw after the eruption of the first molars. *B*, Extraction of the right molar. *C*. The same jaw at the age of nine. The growing second molars have produced half of the needed space on the left by developing this whole side of the jaw, on the right by utilizing the extraction-gap of the first molar. Impediment of growth on the right shifting of the median line. *D*, The same jaw at the age of twelve. After the eruption of the second molars, the left side shows normal development whereas on the right side a remarkable shortening of the jaw is to be found; the teeth in front of the gap have stopped in their mesial directed movement. Extreme shifting of the mesial line.

come out behind the row of milk teeth; that is, three times the width of a molar. Here, it is true, we are only interested in the growth of the width of one molar, during the time from the fourth to the twelfth years of life, since an impediment of growth practically does not occur except then.

The investigation of the jaws of children twelve years old teaches that the growth of the jaw is impeded by the width of one premolar (that is, half a molar) if an extraction of the first molar has taken place at the time from six to seven years of age. The still remaining growth of the width of half a molar must be traced back to the endogenous tendency of growth. That this tendency of growth is not dependent on the existence of teeth has

been proved by the well-known experiments with young dogs, the tooth germs of which were extracted. Their jaws showed heavy impediments of growth, yet did not remain in the stage of their suckling time.

By a comparison of jaws from which at different stages of age teeth have been extracted, there is a possibility of finding out rather exactly what impediments of growth are caused in every case. But for our immediate purpose the statement will be sufficient that, in case of an extraction during the sixth year of age, an impediment of growth by the width of one premolar occurs. (See Figs. 1 and 2.) In case of an extraction which takes place two years later, that is, during the eighth year of age, the shortening of the jaws measures about the width of half a premolar. (See Fig. 3.) Ultimately then,

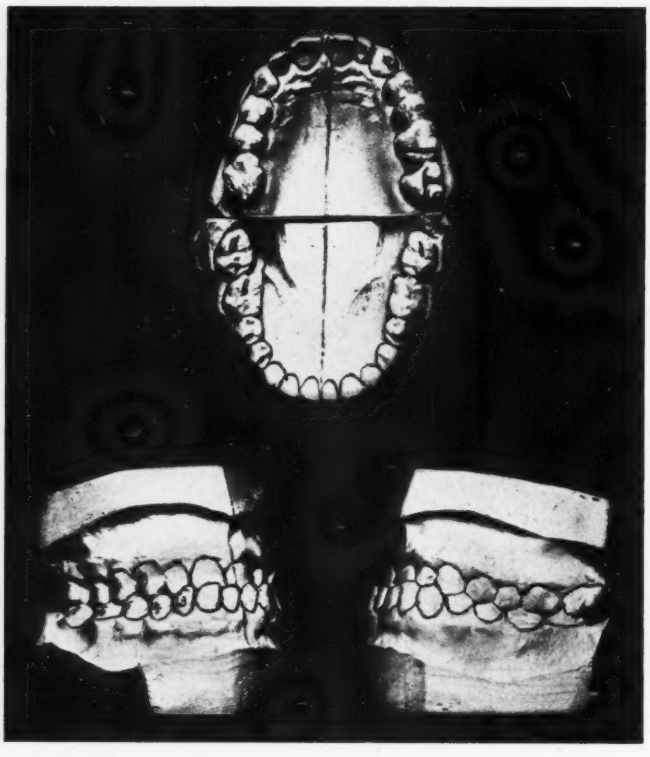


Fig. 2.—A case which shows an impediment of growth on the right side of the upper jaw caused by the extraction of the right first molar at the age of six.

no shortening at all is to be found in case the tooth is removed at the age of about eleven years. This is easily explained by the fact that the growth of the jaw as necessary for twelve-year molars is at that time perfected. (See Figs. 4 and 5.) These same phenomena can be formulated as general laws: In case a tooth is removed before the full growth of the jaw and in case the gap has closed or diminished, the teeth in front of the gap have a distal position in relation to the other (sound) side.*

These extractions form the not intended but none the less valuable experiments on the human being which I in the beginning asked for as neces-

*In this case the teeth do not move towards each other, on the contrary the growth stops and the teeth in front of the gap do not take part in the mesially directed motion of growth. The schematic find their supplements in real cases of which the time of extraction was known.

sary for a real understanding of anomalies. They are in existence in innumerable cases, which—more the pity—have as yet been used very little. It is one of the tasks of social hygiene to make them disappear, a task which, in Bonn, has been almost accomplished.

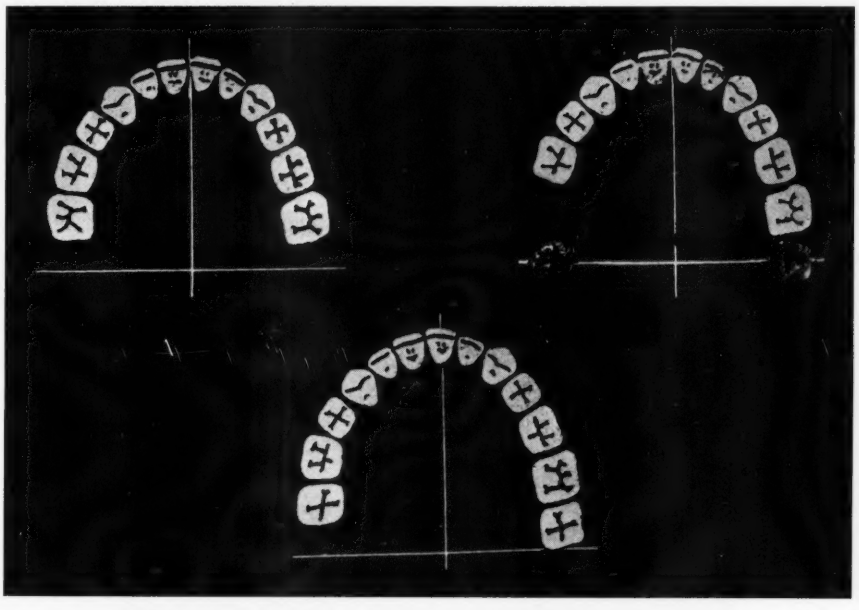


Fig. 3.—Results following the extraction of the right first molar at the age of about nine.

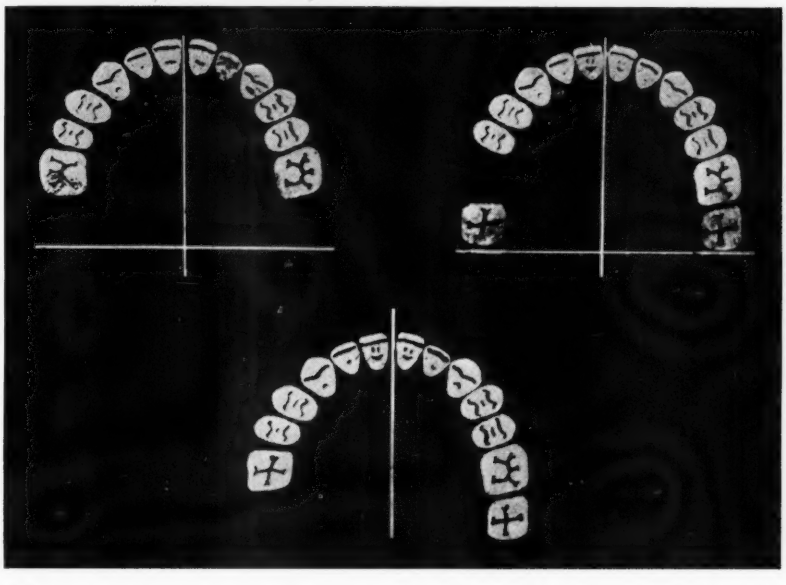


Fig. 4.—Results following the extraction of the right first molar at the age of eleven to twelve years.

Statistics of the number of anomalies with children of the age of six and fourteen (which will appear in another connection and which have also been worked out by Korkhaus) show a surprising result. It will perhaps surprise you, but for us it is only a confirmation of a theoretic deduction; to wit, that a great number of anomalies are cured spontaneously during the time from

six to twelve years of age. The objection that we treated with different annual sets, that is, that it is not the same group of cases which the statistics are made up from, is refuted by the great number of observations which took place and which make chance results impossible. (See Fig. 6.) It is refuted also by the understanding of the development of the curing process which I shall presently show by help of selected series of casts. Our statistics clearly show that the anomalies based on premature extraction of teeth, as well as those caused by the deforming forces which act on a rachitically soft jaw, are reduced. They prove besides, however, that the consequences of trouble of respiration, which have their effect in a compression of the jaw, increase, as during the time of observation they come to their full effect by the development of the adenoid vegetation.

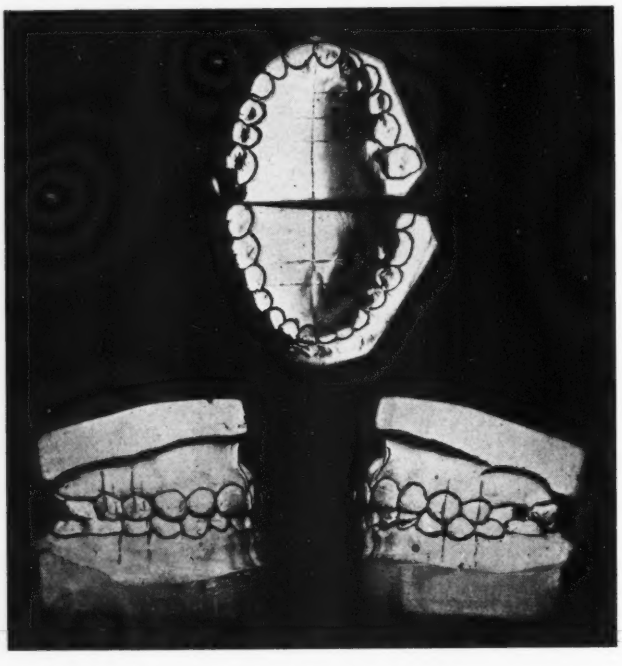


Fig. 5.—Case in which the maxillary right molar has been extracted at the age of nine (note the shortening of the right side and the displacement of median line) whereas on the left the molar was lost at the age of twelve (normal development, autonomous mesial movement of the second molar).

REAL PROCESSES OF CURE

The self-correction of a lower forward projection of the first class, originating in an impediment of growth of the upper jaw is a very instructive case, as it is easily explained. In the added card (see Fig. 7-*B*), the measurements are given which must be considered. (See Figs. 7-*A* and 7-*C*.) From these we are aware that the sagittal distance from M - M line, that is, to the middle of the incisors, which from now on I shall simply call "sagittal," has grown by 4 or 5 mm. during this time. During the time in which the upper jaw has not yet overcome the overbite of the front teeth, that is, up to Cast 3, the lengthening of the axis of the upper jaw effects a moving forth of the lower jaw (which for a while belongs to the third class)—of

course, by a moving forward of the condyle in the still childish joint socket. Only in Cast 4 the mesial occlusion has been replaced by a distal bite, which, however, will not be of long duration; for, just as the upper molar starts its mesial movement only after the eruption of the milk molars, the lower molar will close the gap between the premolars and by this moving forward come into the neutroclusion; that means: a real first class will probably develop.

The great discovery of Angle—the relation between anomaly and occlusion—is, as you see here, only a relative truth. The idea of evolution, not considering the anomaly as if it were something unchangeable, but watching its origin and reduction (cure), goes beyond the classification according to conceptions of natural forms.

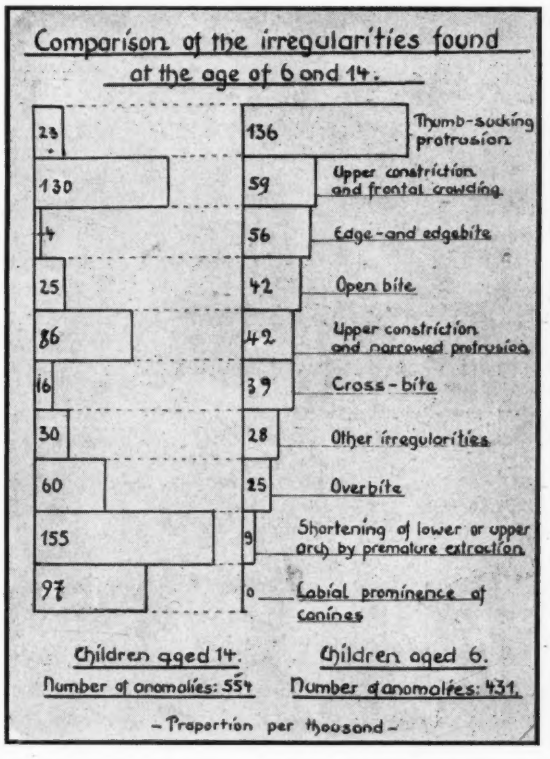


Fig. 6.—Orthodontic statistics by Dr. Korkhaus, Bonn, Germany.

The second case reveals different phenomena. Every case of the third class originates in the first one. Up to the third and fourth year of age, that is, to the moving asunder of the deciduous front teeth which prepare for the second dentition, we have to do with a trifling displacement in the form of a mesial bite at most. Such a case you see in the second series of casts. (See Figs. 8-*A* and 8-*B*.) It occurs comparatively frequently that in a case of lower prognathism in the temporary denture the reverse cutting path of the front teeth disappears after the loss of the deciduous teeth and thus a right eruption of the remaining teeth in neutroclusion becomes possible. In our case this is prevented by the lower canines, the lengthening of which forces the lower jaw into its wrong position. The change comes about during the time which passed between the taking of the second and third cast. If the

deciduous canines had remained in the jaw for a longer time, the upper incisors would have made permanent the reverse bite of the incisors and thereby a forced mesial occlusion of the lower jaw. The loss of the $\overline{III}\,|\,|\,\overline{III}$ combined with a lengthening of the upper saggital line by a width of 3 mm. produces an almost correct relation of the front. As the lower molar at the same time has moved forward 1.5 mm., the distal displacement of the whole lower jaw is veiled in the sphere of the molars.

Every case gives so many diminutive phenomena relating to the moving of the teeth that it would be hopeless to analyze it completely in a large society.



Fig. 7-*A*.—Self correction of a lower prognathism of Angle Class I.

The last cast shows an important displacement of the median line towards the right side; and on the left a developing high labial prominence of the permanent canines, the origin of which is also to be explained without any remaining doubt.

After these explanations our third case is to be understood without further difficulties. (See Figs. 9-*A* and 9-*B*.) It demonstrates the transformation of a lower prognathism of the first class into a neutral bite, even of the front teeth. In the upper jaw the distance of $\underline{III}\,|\,|\,\underline{III}$ has grown 1.5 mm. This widening has overcome the lower overbite which had been caused by the lower canines, and thereby the lower jaw could from its almost mesial occlusion slide back to an almost correct neutroclusion.

From these cases this is our conclusion: Lower prognathism of the first and third classes, as well as unreal lower prognathism may be cured spontaneously. I shall not talk about the fact that we also have found valuable hints as to the origin of the third class, as this does not belong to our subject.

A second series, consisting of only two cases, refers to a spontaneous curing of the shortening of the lower jaw and thereby of the distal occlusion of teeth which have their position in front of a gap, and it is easily understood. The first case had (see Figs. 10-*A* and 10-*B*) narrow position of the front on both sides, distal occlusion of the lower front and of the premolars, diminishing of the gaps. After two years enlarging the gaps by the influ-

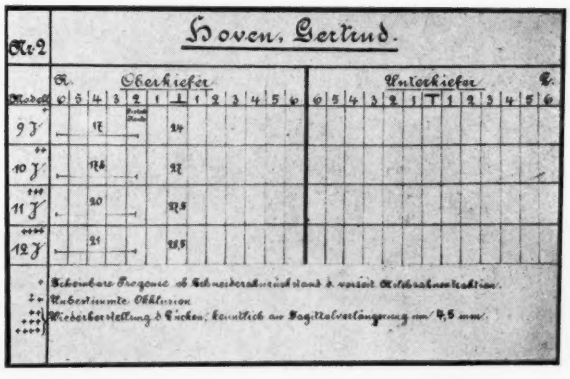


Fig. 7-*B*.—Measurements found in the case of Fig. 7-*A*.

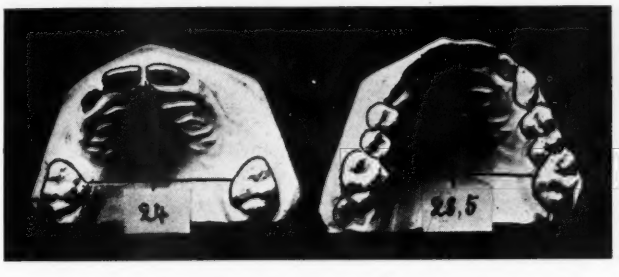


Fig. 7-*C*.—Lengthening of the axis of the maxillary jaw within three years in the case of Fig. 7-*A*.

ence of the eruption of the premolar, decrease of the distal bite which after another year has disappeared, leaving a remainder which is scarcely to be identified any more.

There are just as few problems to be found in the next case as in this one. (See Figs. 11-*A* and 11-*B*.) We find the distal position of the lower teeth in front of the gap, combined with prognathia, which is reduced to an almost correct occlusion in the eleventh year of age and which will probably disappear entirely.

I have not shown these cases in order to demonstrate the spontaneous cure of anomalies of position, but because as unintended experiments they furnish knowledge of the process of growth in the jaws. Therefore, let me now also give you some cases which give an explanation of the origin of the

unilateral distoclusion, totally unexplained until now (Angle Class II, subdivision).

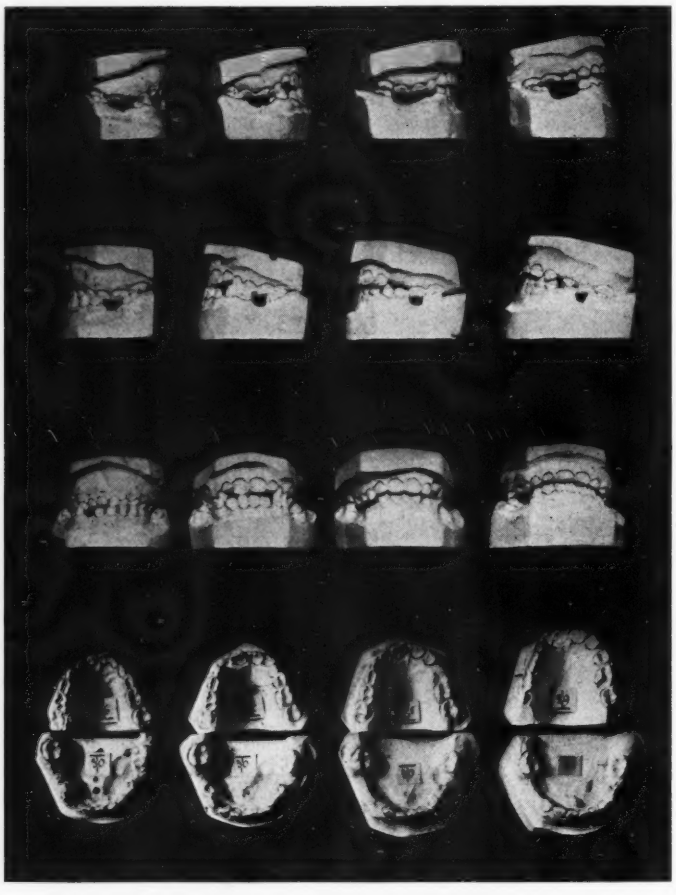


Fig. 8-*A*.—Self correction of a mandibular prognathism with Angle Class III.

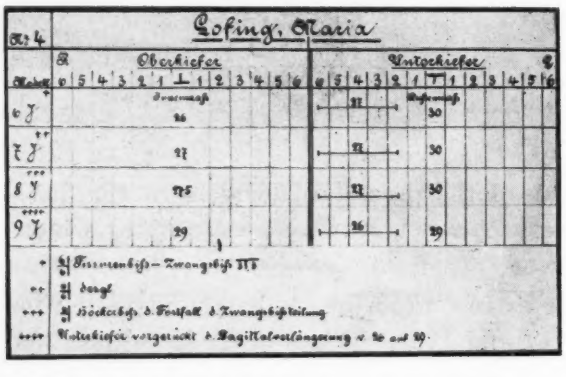


Fig. 8-*B*.—Measurements taken in the case of Fig. 8-*A*.

Our first cast shows—but for a trifling compression of the jaw—a still entirely physiologic occlusion from cusp to cusp of the molars. (See Figs. 12-*A* and 12-*B*.) This series was especially collected to investigate the transition into the fissure bite. The second cast: beginning of the obstruction of growth in consequence of an extraction of the milk molars. The third cast:

on the left side above the molar has moved forward in consequence of an extraction of the second milk molar; at the same time an impediment of growth has arisen. The gap on the left is only 7 mm. wide, while on the right it has the width of one milk molar (11 mm.). And now the unilateral distal bite develops in the course of two years by an obstruction of growth in the lower jaw, moving forward of the molar and obstruction of growth in the upper jaw. This development has not come to an end in the series of casts as we see it, but it can be foreseen without any difficulty from the stages we have before us up until now. The second premolar, which will not



Fig. 9-*A*.—Self correction of a third case of mandibular prognathism.

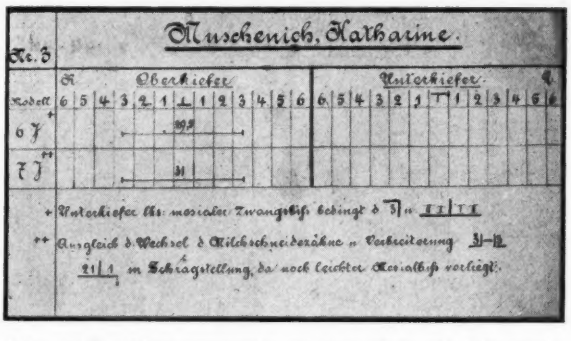


Fig. 9-*B*.—Measurements of the case of Fig. 9-*A*.

find space enough in the gap below, will push the molar back a trifling bit, and thereby it enters the distal fissure bite, whereby the entire anomaly becomes actual. This model also makes it possible to study the displacement of the median lines, which, however, can be seen only by looking from above, as it is already to be found in both jaws.

And now finally one other series which discloses similar conditions. (See Figs. 13-*A* and 13-*B*.)

The cast shows normal occlusion at the age of nine; one year later at the right side by the loss of IV| the first permanent molar has the possibility to move forward and to occupy together with V| the gap of the lost deciduous

molar before appearing of the permanent molar. Cusp and cusp bite. Two years later we find the open bite (infraocclusion of the upper front teeth) cured. Further loss of the milk molars and eruption of the premolars, the gaps so produced are filled by the advancing six-year molars at all sides except the lower right side. Here narrowing at the region of the right canine which uses the place behind itself, in this manner hindering the first molar to come forward. The result: No longer a cusp and cusp bite, but a definite

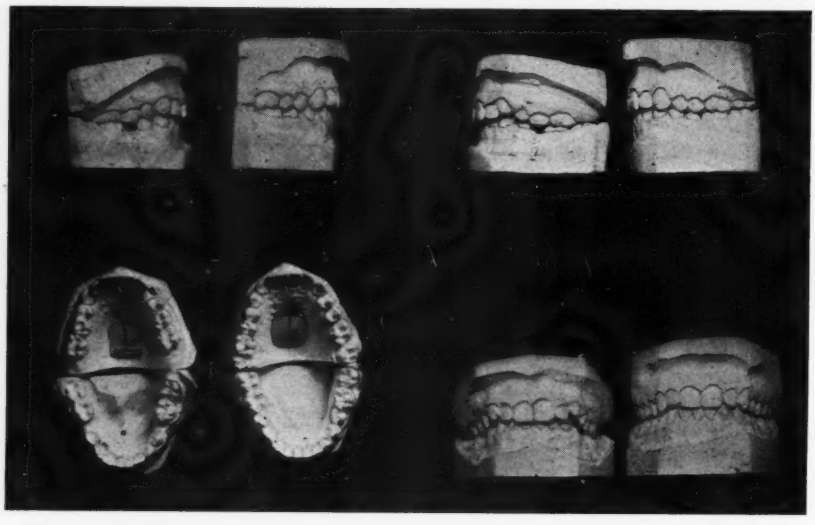


Fig. 10-*A*.—Self correction of a case, showing a shortening of the mandibular jaw and distoclusion of the mandibular front.

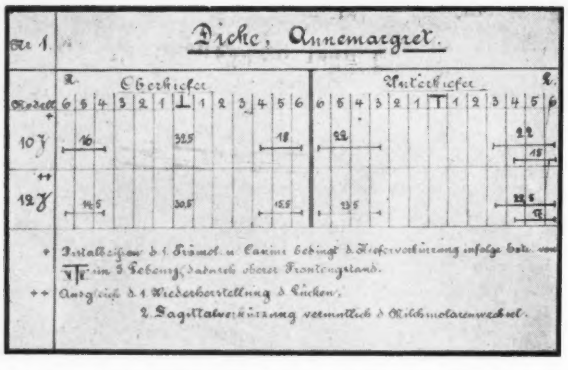


Fig. 10-*B*.—Measurements of the case of Fig. 10-*A*.

distoclusion at the right side. Displacement of the median line. The distal occlusion helped by the hypoplasa of the six-year molars which form cusps with a determinate occlusion.

In the town in the university of which I have the honor of being professor of dentistry, there are no more diseased teeth to be found among our school children. We have destroyed caries of the teeth by systematic care. It is not to be expected that it will ever reappear, since our organization for fighting it is thoroughly consolidated and works well. We are now beginning to fight anomalies just as systematically as caries. There can be no doubt about the fact that this task is much more difficult, since we can

attack caries at their very beginning, while up until now we have explored anomalies only when they were fully developed.

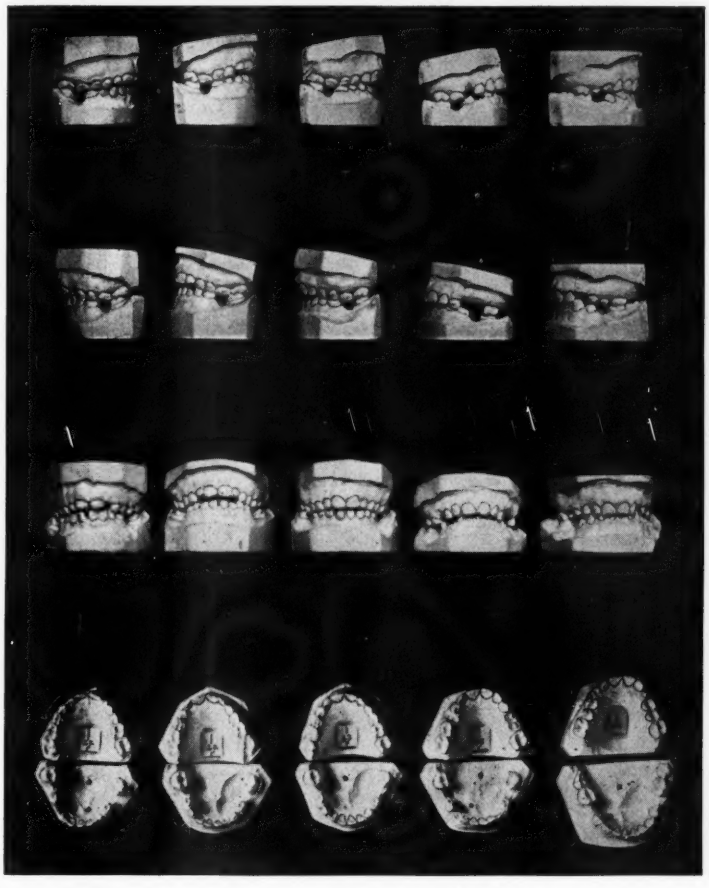


Fig. 11-*A*.—Self correction of a shortening of the mandibular jaw and the distoclusion of the mandibular front.

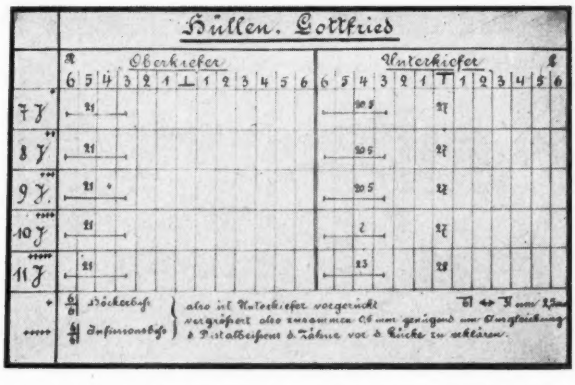


Fig. 11-*B*.—Measurements of the case of Fig. 11-*A*.

If we were to try to treat anomalies according to the method used until now, that is, therapy of the fully developed deformation, an effective fight would be hopeless. Our task was, therefore, to find out *how* they originate, *when* it is best to attack them, at *what* time their treatment will cost the least

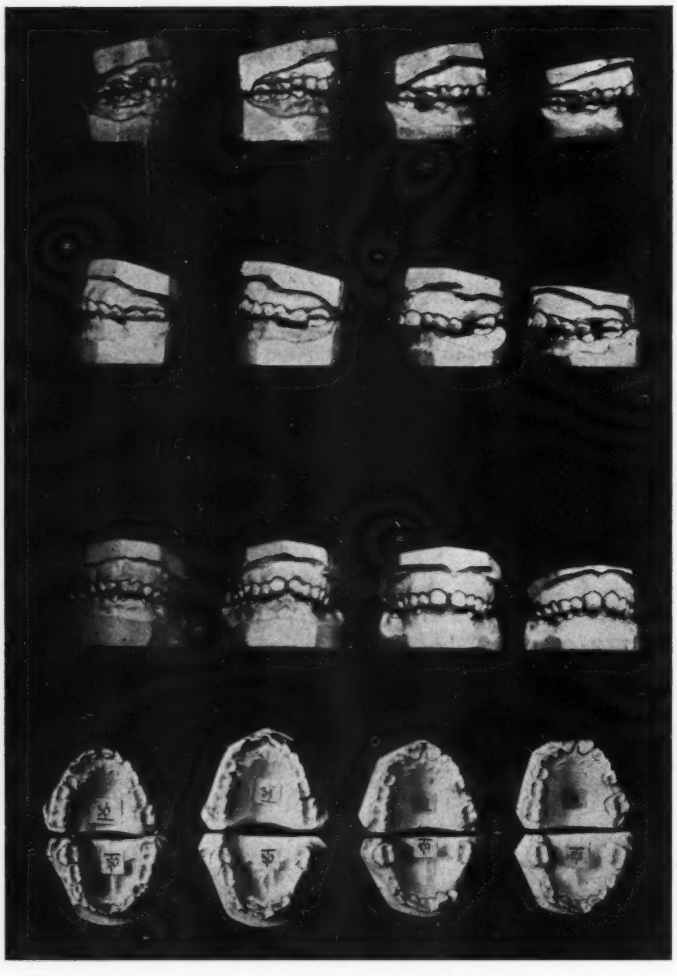


Fig. 12-*A*.—The development of distoclusion.

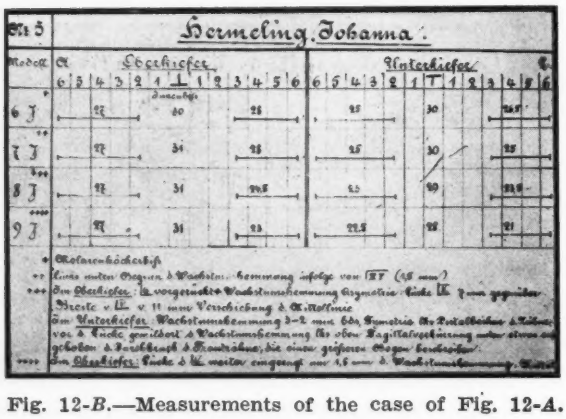


Fig. 12-*B*.—Measurements of the case of Fig. 12-*A*.

possible work and time. Such reasoning called forth the investigations here only partly given. The investigations so far furnish us with a rather complete knowledge of the etiology. We now know all about development, time of origin and inner causes of the majority of anomalies. Now the question



Fig. 13-*A*.—The development of the unilateral distoclusion.

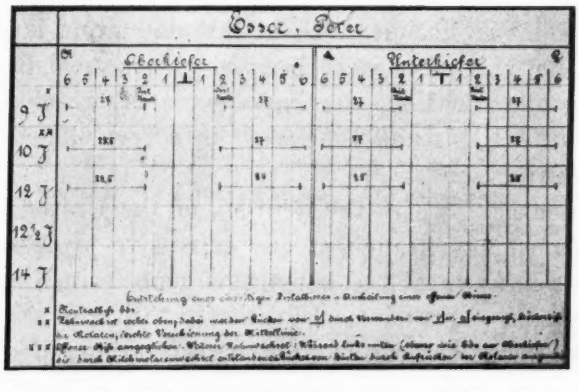


Fig. 13-*B*.—Measurements of the case of Fig. 13-*A*.

will arise, at what moment we are to interrupt the causal nexus. For the anomalies which develop on a rachitic basis, our question is answered without difficulty. Here we, or rather pediatricians, have the duty of interfering even in the first year of age. We, as dentists, have to consider it our duty

to call public attention effectually to the fight of this disease which causes the majority of all anomalies. The cause, second in effect, impediment of growth after premature extraction of milk teeth and first molars, has been restricted so as to almost disappear. At this day it would scarcely be possible to collect cases in Bonn which would furnish material for this demonstration. No anomaly has but one cause; the large majority owe their origin to several causes. Among those, the adenoid vegetation plays the main part. It will be our duty to examine the very beginning of narrow position of teeth (which becomes evident by an absence of gaps) as to the existence of adenoid vegetation. If such is found, we order an operation by the school doctor.

The lower prognathism in its first stages, that is, as long as it belongs to the first class, is a disease easy to cure. In most cases it will be sufficient to remove the already absorbed milk incisors from the lower jaw and thereby make place for the development of the upper jaw. If we follow this method, and supervision is really carried through, we shall not see this ugliest of all anomalies again.

The best thing would be to extend the half-yearly examination (which has been carried through for caries already in our dental school clinics) so as to include anomalies also. Yet only a dentist well trained in orthodontics will be able to accomplish a relevant examination by detecting the very beginning of the anomaly and causing its effective treatment as long as it can be afforded financially.

Thus, we are even now able to prevent the formation of the majority of all anomalies. Further etiologic investigation will give us the clue for the prophylaxis of the remaining anomalies. General phrases, common places as disturbed functions, disturbance of the endocrine glands, phenomena of degeneration, and so on, are not adequate to lead us onward. The speculative era in dentistry and orthodontia has made place for an investigation less interesting but so much the more pertinent and successful, the one which works with measure and compasses. This belongs to the future.

The method of investigation given in this deduction is perhaps contrary to the American one which has more interest in practical problems. It is an enemy of Angle's classification, the importance of which nobody disputes, but it walks abreast with it and touches it in a few places. Its results will slowly become mature.

We German dentists owe to the dentists of the United States extraordinary stimuli in almost any branch of our expansive profession. If my etiologic investigations have furnished some new aspects in this country of dentistry, take them as an expression of gratitude to the dentists of the United States. Let us hope that out of the joint investigations of our two countries wonderful results may arise for our young children as they grow up.

DISCUSSION

Dr. Alfred Paul Rogers.—In his opening paragraph Dr. Kantorowicz has outlined a fundamental principle in the practice of orthodontia. At the same time he has suggested a method of observation which he subsequently shows he has put into practice under what seem to be ideal conditions.

It was my privilege to have placed before me some of the models, in series, that have been used to illustrate this paper. Dr. Kantorowicz pointed out to me the areas where sectional growth had taken place, and also explained his theory of the developments which were observed to appear during that stage of the transitional period covered by the models under observation.

Very often we are half conscious of truths which we are unable to formulate or state as theories capable of being proved experimentally. Thus it has been for many years that observant practitioners of dentistry have been vaguely aware of the fact that dental anomalies were sometimes self-correcting. In the United States, at least, advice to this effect has been given more or less freely by the practitioner of dentistry prior to the development of orthodontia as a specialty. The change of opinion in the early and dogmatic days of orthodontia came in conflict with this idea, and is responsible for the undertaking of mechanical treatment of many dental anomalies which sometimes might have corrected themselves. In the light of experience the pendulum swings again to the side of conservatism so that we now find men in our own profession, specialists of high technical ability and scientific attainment, beginning again to restate the theory without the vagaries of former years, and are, as Dr. Kantorowicz has shown us this afternoon, taking steps to prove the theory entitled to further observation and study.

Dr. Kantorowicz's work has been so thoroughly accomplished that it seems unnecessary for me even to attempt any critical examination of his thesis. It will suffice, I think, if I confine my remarks to suggestions and emphasis. To go back to the early days those of us who are old enough will remember that the old practitioner was more often wrong than right in giving advice based upon his half conscious theory of self-correction. It may be true that upon further investigation Dr. Kantorowicz will be able to tell us that far more dental anomalies develop during the transitional period into permanent anomalies than become self-correcting. In view of this thought, therefore, I would suggest that continued investigation be placed before us at some future date which embraces the study, not only of those favorable developments, but also paralleling them, a series of anomalies either uncorrected or showing a tendency toward greater maldevelopment. With this study might be tabulated the various forces which are observed to exist in these cases of parallel study, but of divergent development.

Thus will be hastened the day that many of us look forward to, when the young man entering orthodontia shall be taught, not so consistently the use of appliances, but instead the use of wisdom and judgment following careful observation. In America we have done something along this line, but perhaps there are no series quite so complete as those shown us by Dr. Kantorowicz. Years ago Kemple asked that a greater consideration be given to the theory of self-correction. Later Hatfield made several series of self-correcting dental anomalies. In it all I see the beginning of a new day—one which may be heralded, but not hastened. We must be careful indeed not to allow ourselves to swing too far to the opposite extreme. My suggestion would be to all those who sense the importance of this valuable paper to, at least, if they have not already done so, hold many of the younger cases under observation for a sufficient length of time to be reasonably sure that the future natural development may not in a measure correct the anomalies which exist.

It has been a pleasure to meet Dr. Kantorowicz, to talk with him and to catch his enthusiasm. In the city of Bonn he is ideally situated to carry out further investigation, and I think we all look forward to the near future with the hope of having something further from him.

THE AGE FOR ORTHODONTIC TREATMENT*

By Harold Chapman, L.D.S., London, Eng.

IN MARCH, 1923, J. Lowe Young dealt with this subject at the meeting of the American Society of Orthodontists in a paper entitled "Early Treatment of Malocclusion,"[1] and, in the discussion, the views of many of the most eminent men in the profession were presented. In the next year Le Roy Johnson writes:[2]

"One's attitude towards it (early orthodontic treatment) reflects the concept of principles fundamental in orthodontia; hence there should be more unanimity of opinion than there is now."

The age for orthodontic treatment is a basic problem in practice on which the profession has not yet arrived at an approach to unanimity of opinion; for this reason I bring the subject forward again.

I have met orthodontists who do not take patients over twelve years of age; I have met others who will treat adults; but what is more remarkable is that there are dental schools in which patients over twelve are not treated, and others where treatment is not undertaken until that age is passed.[3] I can conceive of circumstances in which practitioners in private practice may be right in treating adults, but when different dental schools lay down exactly opposite conditions as regards age for treatment is it not time that the question were ventilated in the most thorough manner possible?

Early this year a pediatrician from California called to discuss with me a case in which I had advised that no treatment be undertaken for two paramount reasons: (1) the malocclusion was in no way severe; arches well shaped but a little small, postnormal relation of lower teeth to upper teeth; and (2) the age of the patient was thirteen years.

Whilst both these points are technical they are also of such a nature that a layman may form an opinion upon them, especially in regard to age for treatment, if the enquiring person has some literature to assist him. The pediatrician consulted one, if not more, works on orthodontics, but did not find the guidance required on the question of age.† As a result of this conversation it seemed to me not inappropriate to promote anew a discussion on the age for orthodontic treatment at such a representative gathering as this.

If the factors to be considered before arriving at a decision as to the treatment of an orthodontic case were tabulated, "AGE" would probably take precedence of place.

Age is the factor about which there can be no two opinions; the orthodontist has no control over it; it changes in one direction only; if he could, the orthodontist would wish to change it in the opposite direction unless he

*Read before the First International Orthodontic Congress, New York City, August 16-20, 1926.

†Herbert A. Pullen, D.M.D., discusses this question under the heading "Early Treatment of Arrested Developmental Conditions in the Arches" in "Operative Dentistry" 4th Edition, edited by C. N. Johnson, p. 863. The views expressed are in effect similar to those expressed in this paper.

belongs to the school which believes in postponing treatment. Translated into practical terms, the reason age is a predominant factor is that at one period, the early period, treatment may give good results, and at another, the late period, good results may be an impossibility; in the intermediate period the results of treatment, looked at from every point of view, gradually degenerate from good to very poor as the age increases.

THE AGE FOR ORTHODONTIC TREATMENT

The subject will be considered under four headings:

1. General considerations.
   (a) Etiology.
   (b) Pathologic anatomy.
2. Treatment at age six.
3. Treatment at age nine.
4. Treatment at age twelve.

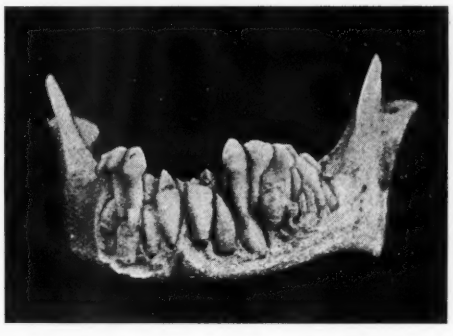


Fig. 1.—A mandible at age six, too narrow for the incisors in good alignment. In treatment not later than six years of age it is more probable that the entire bone, including the lower border and the condyles, will respond to "expansion" better than it would at age nine. (Taken from Colyer's "Dental Surgery and Pathology," 5th Ed. Fig. 179.)

1. GENERAL CONSIDERATIONS

An opinion on the age for treatment must be based (in part if not entirely) on the views one holds in regard to:

(a) *Etiology.*

(b) *Pathologic anatomy* (of malocclusion).

(a) *Etiology.*—I am one of those who believe that all cases of malocclusion, almost without exception, are in being not later than two years of age; I also believe that many of them have their origin at a still earlier age. (I am not considering local causes at all.) As a consequence of that belief it is my opinion that treatment for such cases should be undertaken at the earliest age possible, say at three years, but this may be impracticable, and if it is I do not think it need often be delayed beyond six years of age.

Probably no teaching is more pernicious than that it is necessary to wait for the eruption of the second permanent molars before any treatment is undertaken; its seriousness cannot be overestimated; the harm it does is incalculable because the result of treatment at the late date is jeopardized; it may necessitate the adoption of a method of treatment which will not give

as good a result as another that might have been adopted satisfactorily at a younger age, even if it does not render any treatment contraindicated.

(b) *Pathologic anatomy.*—Keith and Campion have given the term "masticating face" to the particular area which they believe to be the masticatory apparatus and which I believe our treatment should influence.

The masticating face includes the area below the glabella[4] and in front of the external auditory meatus (Fig. 2). Therefore occlusal abnormalities include bone abnormalities of that entire area; perfect orthodontic treatment should influence that area in its entirety, and not the teeth alone or, in addition, the alveolar process, or the maxillary base, or even the maxilla and mandible alone but the whole area shown in Figs. 1 and 2. In other words, a far-reaching orthopedic operation has to be performed and, to a great extent, it has to be carried through by operations on the teeth.

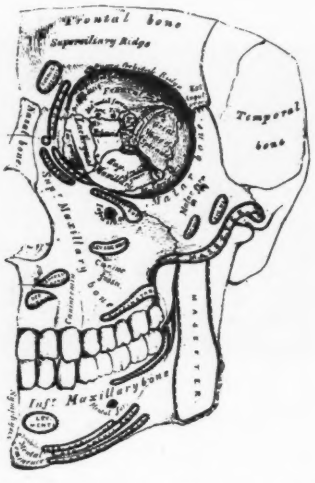


Fig. 2.—The area comprised in the masticating face of Keith and Campion (Taken from Gray's Anatomy, 14th Ed. Fig. 186). Figs. 1 and 2 are used by kind permission of Messrs. Longmans, Green & Co., London.

The orthodontist's particular orthopedic problem is to treat all the bones of the masticating face; the treatment will be the more successful the sooner it is undertaken after the inception of the abnormality. The orthodontist knows that to succeed in such treatment he must do more than move teeth; the teeth permanently in their new positions are the sign that those orthopedic changes have been made in the masticating face which give to it its correct size and shape and functions; these include normal functions of the teeth, tongue, lips, cheeks and nose.

From the point of view of the results of treatment, occlusion rightly dominates the situation for the orthodontist as esthetics do for the patient and parents, but the possibilities of obtaining perfection both of occlusion and esthetics, are in turn dominated by the age of the patient (whilst not the only factor, age is one of the most important), because orthodontics is orthopedics of the masticating face and one of the requirements for successful orthopedic treatment is that it shall be undertaken as early as possible.

I submit most emphatically that the earlier any malformation of these bones is corrected and the earlier their functions and the functions of the associated tissues are made normal then the earlier all these parts will be started along correct and proper lines for their future growth and development; it is obvious that any growing thing, whether animal or plant, will suffer the more and become the more deformed the longer such growth and development is permitted to proceed along lines that have led to malformation. This alone is ample and sufficient reason for undertaking orthodontic treatment as early as it is possible to diagnose it, and as early as it is practicable to treat it.

If there is agreement with this statement then it follows the longer treatment is postponed, the less the possibilities of treatment and the more in jeopardy is a perfect result, which involves so much more than teeth, it involves the bones of the face as far as the external angular processes[4] (Fig. 2), which may need to be included along with the dental arch in expansion.



Fig. 3.—Normal arches, age four.

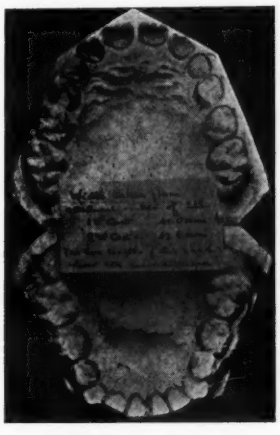


Fig. 4.—Normal arches, age six. (The same boy as Fig. 3.)

Figs. 3 and 4.—Case No. 6. Normal arches, shown for comparison with the arches of the five subsequent cases.

Will any orthodontist say that as good a result may be obtained in a Class I or Class II case at twelve years of age as would be obtained if treatment had been undertaken at six years of age; if the answer is "NO" (and as a general principle I can conceive of no other answer), then it would be futile to pursue the subject further were it not desirable and possible to adduce other sound arguments for the belief that six years or earlier is the age of election at which to begin orthodontic treatment. In addition, there is the unassailable dictum that if benefits are derivable from any treatment those benefits should be available at the very earliest moment.

2. REASONS FOR EARLY TREATMENT AT ABOUT AGE SIX

i. Treatment is orthopedic in character.

ii. Treatment of one arch only, may be upper or lower, frequently is accompanied by improvement in the other arch, though no appliances are used for it.

iii. All tooth and jaw movements are more easily accomplished the earlier they are undertaken; also the easier and better the retention; therefore, the final result is better.

(a) Alignment and rotation are more easily corrected.

(b) Buccolingual malrelations of all teeth are more easily corrected.
(c) Incorrect anteroposterior relations of maxilla and mandible are more easily corrected.
(d) Excessive overbite is more easily corrected at this age than at any other.

iv. Mouth breathing and incorrect lip function should be corrected as early as possible.

v. Benefits of treatment should be available as early as possible.

vi. Deciduous teeth are used to correct the condition; thereby the risk of damage, including caries, root absorption and injury to peridental membrane, to permanent teeth and associated tissues, is diminished.

vii. Recovery from tissue disturbance is quicker and more complete.

viii. Social factors.

i. *Treatment Is Orthopedic in Character.*

I was interested recently in reading a textbook on orthopedics[5] and was struck by the similarity of the requirements for successful treatment in that branch of surgery as in our branch of dentistry. Some of these requirements for successful orthopedic treatment are:



Fig. 5.—Models No. 633. Age six years, ten months, occlusal views.

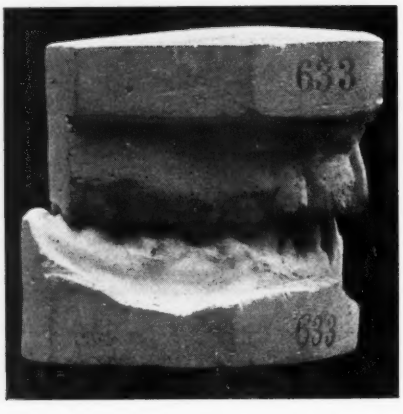


Fig. 6.—Models No. 633. Age six years, ten months, right side in occlusion.

1. Overcorrection.
2. Education (re-education of muscle sense).
3. Voluntary effort.
4. Function.
5. Normal intelligence.
6. Perseverance.
7. Surgeon must see exercises performed.
8. Home treatment.
9. Maintenance of improved position all day.

I also noted the following:

1. Acquired deformities are:
   i. Postural.
   ii. Structural (later stage of postural).

The latter cannot be got rid of at (say) age eighteen, but posture can be improved.

2. Rigid holding of bones causes muscles to atrophy.

How exactly all this, from a book on orthopedics, applies to orthodontics!

If the orthodontic problem is regarded as an orthopedic one, one of bone maldevelopment, in which the teeth and the occlusion are incidents rather than a dental or occlusal problem, then the precepts governing orthopedic treatment apply; the earlier that treatment the greater its success. When orthopedic surgeons have to treat bone deformities they prefer to treat them as soon after the development of the deformity as possible. In addition, and like ourselves, the orthopedic surgeons have also suffered, or perhaps I should say their patients have suffered, because they, the patients, were told to wait until such and such a time before submitting to treatment.

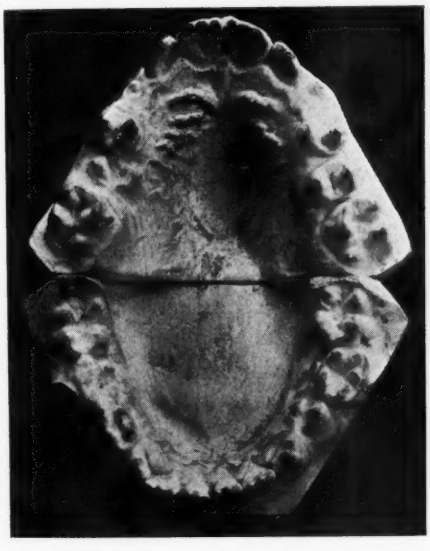


Fig. 7.—Models No. 633A. Age nine years, nine months, occlusal views.



Fig. 8.—Models No. 633A. Age nine years, nine months, right side in occlusion.

Figs. 5-8.—Case No. 633, Class I, age six years, ten months. Arches small; prominence and rotation of $\underline{1/1}$; crowding of $\underline{\overline{21/12}}$. Only teeth banded $\frac{e/e}{e/e}$; maxillary and mandibular lingual arches and high labial arch used; size and shape of arches corrected; loss of e/e before $\overline{e/e}$ is the temporary cause of malrelation of $\overline{6/6}$ to $\underline{6/6}$. No further treatment anticipated.

What is the orthodontist's particular orthopedic problem? Is it simply to correct the alignment and relations of the teeth? and the size, shape and relations of the maxilla and mandible? Whilst these two bones contain the teeth it does not follow that they alone are at fault; if they are at fault their articular areas also are at fault and if these are at fault then the bones articulating with those articular areas are also at fault, and so on, almost *ad infinitum*, if not *ad infinitum* until all the bones of the masticating face (Fig. 2) are included. If treatment is to influence, through the intermediary of the teeth, by mechanical means and by functional means as well as by normal respiration, if treatment is to influence the entire masticating face (i.e., many other bones besides the maxillary bones), then I contend we cannot start too

early; the sooner, i.e., the younger the patient when we make the jaws the size and shape and put them in the relations they should be, then the earlier shall we put the remaining bones of the masticating face in as good shape as possible and the earlier shall we enable their development to proceed on lines



Fig. 9.—Models No. 624A. Age four years, two months, occlusal views.



Fig. 10.—Models No. 624A. Age four years, two months, right and left sides in occlusion.



Fig. 11.—Models No. 624A. Age four years, two months, front view in occlusion.

nearer normal; in addition, the greater plasticity of the bones at six years than at twelve years permits the effects of early treatment on the bones, and especially on those bones beyond the maxilla and mandible, to be much greater than the latter age, or at any subsequent period whether one year or ten years later. To me an argument of this character permits of no refuta-

tion. Nevertheless, I will now call your attention to further arguments that *six years or earlier* is the age of election at which to begin orthodontic treatment.

ii. *Treatment of one Arch Only, May be Upper or Lower, Frequently is Accompanied by Improvement in the Other Arch Though no Appliances are Used for it.*



Fig. 12.—Models No. 624B. Age seven years, two months, occlusal views.

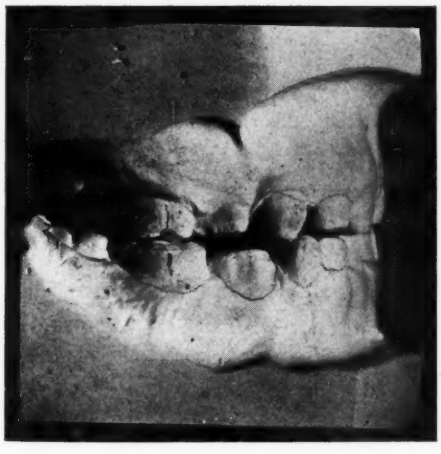


Fig. 13.—Models No. 624B. Age seven years, two months, right side in occlusion.

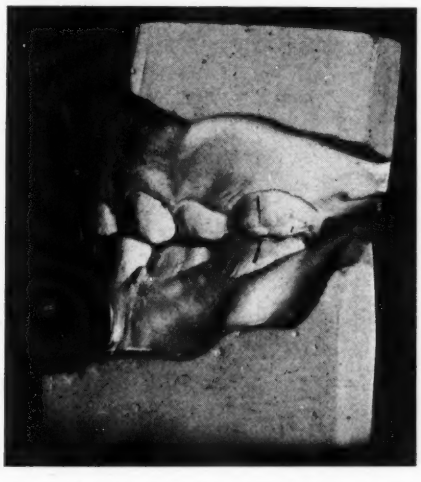


Fig. 14.—Models No. 624B. Age seven years, two months, left side in occlusion.

You are familiar with the fact that expansion of a lower arch will also bring about a similar result in the upper arch in patients about six years of age without the use of appliances on the upper teeth. I have also seen the lower arch enlarge and come forward without the use of appliances whilst the upper arch was being expanded with a screw bite plate in a Class II case, the patient being six years of age. Le Roy Johnson[2] reports similar experiences, but I have not heard of such results in patients as old as eight or nine years.

These changes without appliances are in part due to the occlusal relations of the upper and lower teeth; but there is another relation between the maxilla and mandible; it is at the temporomandibular joint and if these joint areas are widened in one jaw there must also be widening in the other and my contention is that the younger the age at which a dental arch is widened the greater the possibility of that widened arch increasing the width between the condyles and the glenoid fossa, in addition to increasing the width between the teeth.

The arguments to be adduced further on will bring out the great advantages, or rather the absence of disadvantages, of treatment without any appliances in one jaw; they are so obvious as not to need reiteration.

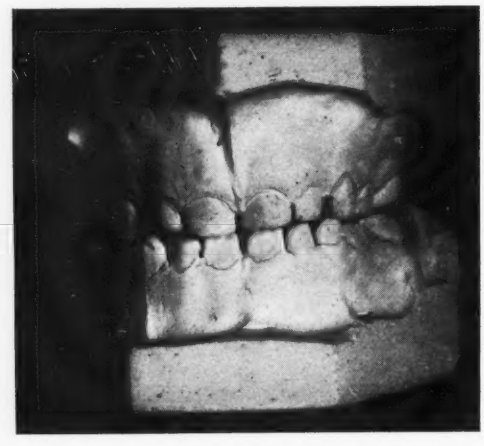


Fig. 15.—Models No. 624B. Age seven years, two months, front view in occlusion.

Figs. 9 to 15. Case No. 624, Class I, age four years, two months. Arches very small, especially upper. Only teeth banded $\frac{e/e}{e/e.}$ Arches enlarged to make them large enough for the permanent teeth; lower incisors just erupting.

Figs. 5 to 15. Five cases in which treatment was considered necessary; three of the cases have been treated, and the results are shown; compare the original models of these cases with Figs. 3 and 4.

iii. *All Tooth Movements are More Easily Accomplished the Earlier they are Undertaken and the Easier and Better the Retention.*

(a) Alignment and Rotation of Incisors are Easily Corrected.

Because:

i. Space is made for malaligned and rotated teeth which may not correct themselves.
ii. Roots of teeth are partially formed.
iii. Last portion of root is calcified when the tooth is in its correct position.

In cases where there is narrowness of the arches of the deciduous teeth, with probable subsequent and consequent malplacement of the permanent incisors, e.g., imbrication and rotation, such condition of the permanent teeth (e.g., Fig. 1) may be avoided frequently by early treatment (expansion) because they are given the space necessary for their correct alignment on eruption (in other words, they erupt in their correct positions instead of

erupting in incorrect ones and having to be moved into correct ones later) or, if this does not occur, the alignment and rotation are effected with ease (without an appliance being fixed and cemented to these particular teeth), by very little artificial pressure on the prominent corners, if the natural forces of the opposing teeth, lips and tongue do not bring this about; this is due not only to the more plastic state of the bone at this time than later, but to the fact that the roots are only one-third to one-half formed, enabling any movement, may be by natural or artificial means, to be accomplished easily.



Fig. 16.—Models No. 512. Age eight years, occlusal views.

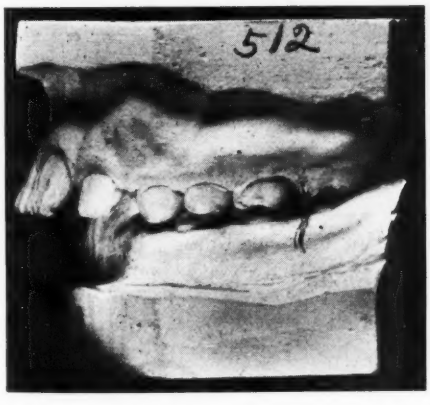


Fig. 17.—Models No. 512. Age eight years, left side in occlusion.

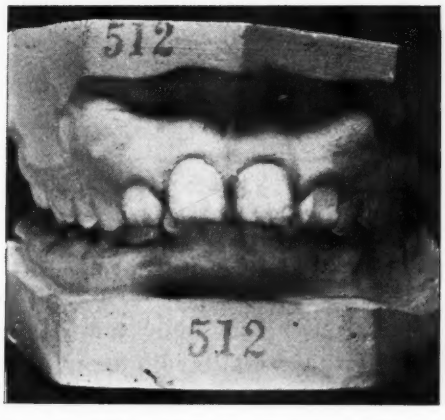


Fig. 18.—Models No. 512. Age eight years, front in occlusion.

There is another factor of equally great importance, if all such teeth, whatever the direction of movement, remain in their new and correct positions whilst the remainder of the root is formed, this last calcified portion of the tooth with its surrounding membrane and bone, is laid down in the position it is to occupy finally and is never subjected to any artificial pressure, except the little that may be necessary for retention. Such treatment, whereby the formation of the tooth is completed after it has been moved into its final position, must be of great advantage to the well-being of all the tissues involved,

as well as be the most effective retaining appliance imaginable. (Figs. 3, 4, also 5 to 8, Case No. 633, and Figs. 9 to 15, Case No. 624.)

(b) Buccolingual Malrelations of all Teeth are More Easily Corrected.

Some operators who are not wholeheartedly in favor of treatment as early as six years agree that the malrelations of individual teeth; e.g., those buccolingual malrelations of upper and lower incisors and canines, deciduous and permanent, which involve moving the upper incisors forward over the lower incisors, or *vice versa,* and upper and lower premolars and molars, deciduous and permanent, should be corrected as early as possible, certainly in the deciduous dentition, and especially as regards the incisors, because they are conditions which cannot conceivably correct themselves.

I agree with this view and contend that it is equally undesirable to perpetuate for a moment longer than necessary:



Fig. 19.—Models No. 512E. Age eleven years, occlusal views.

(1) These particular malrelations of teeth and
(2) All other errors, e.g., rotations and malalignments in arches too small (whatever the type of case) or better still prevent their development.
(3) The bone malformation and a continuance of its maldevelopment (of both of which the positions of the teeth are but a sign),

and any other malformation of bone and malrelations of teeth because the malformation and continuing maldevelopment would be perpetuated so long as such relations of the teeth continued; almost for a certainty any abnormal conditions existing in the deciduous denture would be perpetuated in similar abnormal relations of the permanent teeth.

This argument would appear to be equally applicable to mediodistal errors of the upper and lower teeth, or to anteroposterior relations of maxilla and mandible, though the writer is not sure that it is so regarded by those who are in favor of the early correction of those incisor relations referred to above. (Figs. 9 to 15, Case No. 624.)

(c) Incorrect Anteroposterior Relations of Maxilla and Mandible are More Easily Corrected.

In the case of errors of the anteroposterior relations of the mandible to the maxilla, it is not known what changes, incidental to the correction of these, take place, but it may be assumed with confidence that a change in the region or neighborhood of the temporomandibular articulation is one of the results of such treatment and as such a change is essentially orthopedic in nature, the earlier it is brought about the easier and quicker will a permanent result be obtained. (Figs. 16 to 21, Case No. 512.)

(d) Excessive Overbite Is More Easily Corrected at This Age Than at Any Other.

Excessive overbite is another condition which calls for treatment at about six years of age, i.e., at the time of eruption of the first permanent molars, this is probably the best time of all, for if it is not taken advantage of



Fig. 20.—Models No. 512E. Age eleven years, left side in occlusion.

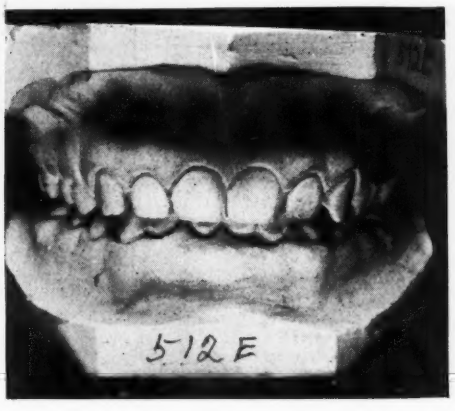


Fig. 21.—Models No. 512E. Age eleven years, front in occlusion.

Figs. 16 to 21. Case No. 512. Class II, Div. 1. Excessive overbite. Age eight years. Size, shape and relation of arches corrected. Only teeth banded $\frac{e/e}{e/e.}$ All premolars erupted. Hawley bite plate still worn. No other treatment anticipated. This patient is older than I would select, but the case shows the premolars all in occlusion without treatment specially for them.

it may not be possible to correct the condition until the second permanent molars are erupting and then not so satisfactorily as at the earlier period; the latter also offers a choice of methods of treatment, one[1] of which is not applicable at the later period. (Figs. 16 to 21, Case No. 512.)

iv. *Mouth Breathing and Incorrect Lip Function Should be Corrected as Early as Possible.*

In cases of malocclusion, where there is incorrect lip function, with or without mouth breathing, or when mouth breathing persists without the other disabilities, these errors quickly become habitual and the longer such habits are allowed to persist the more difficult will their cure be; conversely, the earlier they are treated, the easier their cure; in addition, the patient has the advantage of a corrected condition at as early an age as possible, which is

of no small importance in mouth breathing cases. These habits are frequently the result of or coincident with the relations of the upper and lower incisors to one another and it is necessary to correct these before or at the same time as the habits are taken in hand. In many such cases it is not practical to attempt the correction of the mouth breathing until the relations of the teeth have been corrected. (Figs. 16 to 21, Case No. 512.)

v. *Benefits of Treatment Should be Available as Early as Possible.*

The value of the early correction of mouth breathing has just been referred to; it needs no argument to support the statement that if orthodontics is able to confer any benefits they should not be deferred one moment longer than is necessary.



Fig. 22.—Case No. 965. Occlusal view.

vi. *Deciduous Teeth are Used to Correct the Condition; Thereby the Risk of Damage, Including Caries, to Permanent Teeth and Associated Tissues is Diminished.*

Risk of injury to permanent teeth and associated tissues is reduced if the deciduous teeth are used as agents in the treatment, orthopedic in character rather than dental, instead of the permanent ones. If orthodontic treatment could be confined to the deciduous dentition, there would be no question about harm to the permanent teeth, peridental membrane, etc., as the result of appliances. Harm to the teeth and soft tissues may be caused by badly made, adjusted, and cared for appliances; as regards others, against which no indictment is possible, is there an orthodontist who would claim that the wearing of orthodontic apparatus is desirable *per se;* better not to have a dentition which does not require such, but if it is necessary to wear appliances then the least our patients are entitled to demand is that such risk be reduced to a minimum, and I maintain that the least risk is incurred by using the deciduous teeth in preference to the permanent teeth as our agents in the treatment. Frequently the treatment can be completed, excepting perhaps the final retention, before the loss of the second deciduous molars. (Figs. 22 to 25, Cases Nos. 965 and 1106, illustrate two such cases.)

vii. *Recovery From Tissue Disturbance is Quicker and More Complete.*

Orthodontic operations are accompanied by tissue disturbance however slight, they might even be described as producing a mild degree of trauma; in matters of general health we know that the younger the patient the quicker and better the recovery and I submit that this is equally true in orthodontic treatment.

viii. *Social Factors.*

The younger the patient the less treatment will interfere with school attendance and other adjuncts and amenities of social life; this is of importance because any interference with the work of the operator is to be deprecated and, similarly, the less the orthodontist encroaches on the time of the patient the more his services will be appreciated; again, the patient's time is of greater consideration as he or she increases in age.



Fig. 23.—Case No. 965. Left side in occlusion.

Figs. 22 and 23.—Case No. 965. Class II, Div. 1. Age six years, nine months.

3. REASONS FOR TREATMENT ABOUT AGE NINE

i. It is not possible at age six to tell how the case will develop.
ii. The treatment will be positively completed in three to four years.
iii. All the permanent teeth, except the third permanent molars, have erupted, or are about to erupt, and the positions of all these will be under the control of the operator, without unduly prolonging the treatment.
iv. One set of anchor bands, on the first permanent molars, will suffice throughout the treatment.
v. The patients are more amenable.

i. *It is not Possible at Age Six to Tell How the Case Will Develop.*

There may be some cases in which it is not possible to say whether they will develop sufficiently to satisfy all concerned, but the cases I have in mind were in my opinion certain not to develop satisfactory arches and occlusion, even if they improved at all. We know that numerous such cases develop into severe cases of malocclusion at nine or twelve years of age, and at present we have no satisfactory knowledge that any of them improve so much that treatment becomes contraindicated.

ii. *The Treatment Will be Positively Completed in Three to Four Years.*

It must be admitted that if one could promise to complete a case in three or four years that it is a matter worthy of consideration; even if this could be promised without fail it is just as possible and more probable to complete absolutely a case started at six years of age, or earlier, in three or four years than at age nine. The period over which the treatment is spread might be greater at six but the amount of time spent in the dental chair and the total amount of time during which appliances are worn would be less, and the final result would be better from all those points of view already dealt with. I would say that if the teeth of both arches be correctly aligned whilst there are six deciduous (the molars and canines) teeth *in situ* in each arch and not later than the eruption of the upper and lower incisors, the very best has been done for the patient.



Fig. 24.—Case No. 1106. Occlusal views.

iii. *All the Permanent Teeth, Except the Third Permanent Molars Have Erupted, or are About to Erupt, and the Positions of All These Will Be Under the Control of the Operator, Without Unduly Prolonging the Treatment.*

There is scarcely a case of malocclusion which does not call for treatment of the incisors in one way or another, the difficulty of aligning these teeth and *keeping* them in their new positions is much greater when treatment is undertaken at nine years of age than at six years; this is an advantage so great that I have no hesitation in saying that as a rule no considerations will outweigh it.

If the spaces are made (e.g., for the incisors) and kept (e.g., by preserving the deciduous canines and molars) for the unerupted permanent teeth, the latter are given the best chance for erupting into satisfactory positions. If the deciduous teeth are lost at the proper time and the permanent successors erupt at the proper time then it will not be often that any of the latter need special consideration. It is to the advantage of the denture that the correction of

any malocclusion should be completed before the second deciduous molars are lost, so that the changes[6] which occur when they are lost and replaced by premolars shall not be interfered with by the presence of appliances.

iv. *One Set of Anchor Bands Will Suffice Throughout the Treatment.*

The making and fitting of an extra set of anchor bands is a small matter in any case and a negligible point if the teeth will benefit; it should require no argument to substantiate the dictum that the less a tooth is used for anchorage the better for the general health of that tooth, and it is only natural that the wearing of a band, however well fitted, on a tooth and the subjection of such a tooth, as anchor tooth, to various pressures and work for which it was not intended, must result in changes to the tissues supporting the tooth; such changes probably are similar to age changes, they might be called premature age changes, therefore, I have no hesitation in saying that the less permanent teeth have to be banded and the less they have to be used for anchorage the better it will be for the general welfare of those



Fig. 25.—Case No. 1106. Left side in occlusion.

Figs. 24 and 25.—Case 1106. Class II, Div. 2. Age six years, seven months, shown as cases in which treatment should be started without delay; compare with Figs. 3 and 4.

teeth, and this happy state of affairs is possible by early treatment which will permit the deciduous teeth to be used for this purpose. In Class I cases, even anchor bands may be dispensed with on the deciduous molars and gold inlays[7] used in their place for the attachment of the half-round tubes; the effect of the inlays on the tissues supporting the teeth is considerably less than bands would be; if inlays are used the teeth have not to be separated.

v. *The Patients Are More Amenable.*

Patients may be more amenable at the later age in a few cases, but the writer does not find patients of five or six years more difficult to treat than those of double these ages, nor has treatment been delayed, nor our work made unnecessarily difficult on this account.

4. TREATMENT AFTER AGE TWELVE

The desirable course is not to accept patients after twelve years of age for treatment, better to have completed the treatment by that time than to

begin it. However, the desirability, even the necessity, of treatment for the improvement of the appearance may be so great that it is better to treat the case after age twelve than to leave it as it is and allow the patient to grow up a conspicuous object, if the patient, parent and orthodontist are convinced that the advantages thus gained are greater than the disadvantages which will accrue from the late treatment. McCoy's[8] book contains a very apt paragraph in this connection, he says:

"A child with a receding chin, protruding upper teeth and short underdeveloped upper lip is often judged stupid because of its appearance. A child judged stupid will soon divine the attitude of those who so judge it, and will become more or less convinced that it is stupid, and frequently develop traits of indecision and weakness, and will begin to doubt its ability to successfully cope with its environment. A child who is mentally strong enough to rise above such influences will still be keenly sensitive to its misfortunes and as a result will suffer great unhappiness."

If we remember that the advantages of early treatment are lost at twelve years of age and as the patient gets older are not only lost, but that serious disadvantages are likely to accrue as a result of late treatment, if we remember too that the permanency of the teeth in their new positions, which in turn implies correction of malformations of the masticating face and the normal functioning of all parts, cure of habits, etc., is the criterion of successful treatment, then we shall hesitate, and hesitate long, before undertaking cases as late as twelve years of age, or even before that age. If a patient, too old for treatment in our mature judgment, consents to wear an appliance more or less permanently to keep the teeth in their new positions because he or she considers that the advantage of the improved esthetics more than offsets the disadvantages (already detailed) incurred in maintaining this esthetic result, then I agree that such cases merit the best we can do for them. But the foremost duty of the orthodontist is to give to the tissues comprising the masticating face their normal forms and functions as early as possible, and to guide their future growth and development along correct lines.

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DISCUSSION

Dr. Hugh K. Hatfield, Boston, Mass.—I am so much in agreement with the principle theme of Dr. Chapman's paper, that I hesitate to make any comment that might be construed as favoring any other than early treatment. It may be well then, at the outset, to

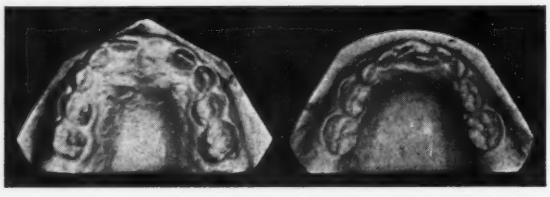


Age 5—Deciduous molars 25 mm.
Age 7—Deciduous molars 25 mm.
Age 8—Deciduous molars 25 mm.
Age 9—Deciduous molars 30 mm.

Fig. 1.—Observations of natural tendency in development without treatment.



Age 6 years. Upper deciduous molars 26 mm.



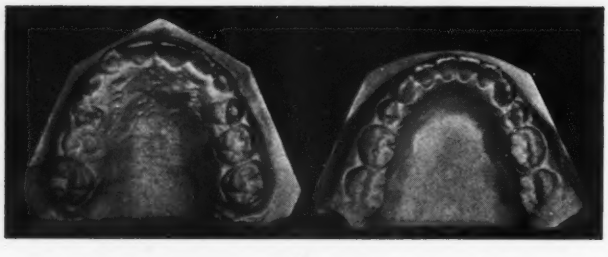
Age 7 years. Upper deciduous molars 26 mm.



Age 8 years. Upper deciduous molars 27 mm.



Age 9 years. Upper deciduous molars 28 mm.



Age ten years. Upper deciduous molars.

Fig. 2.—Tooth relations indicating natural developmental changes. Note development in premolar region; also in the anterior part of the arch.

disown any intention of minimizing in the slightest, the emphasis he has so rightly placed on it, when I bring to your notice certain phases of the subject that have been but dimly suggested in the paper. Dr. Chapman has reviewed the *advantages* of early treatment, I would almost say to the point of repletion; in order to offset the danger of losing sight of



Fig. 3.—Maxillary deciduous molar, width 25 mm. at the age of six. Second premolar width 30 mm. at the age of thirteen.



Fig. 4.—No appreciable change in width between six and twelve years. Deciduous molar, width at six years was 27 mm. Closing of the incisor space is to be noted, also the shifting of sixth year molar after loss of deciduous tooth, in the mandibular jaw.

some of the basic principles on which the idea was founded, I propose to discuss the *disadvantages.*

One cannot regard without some apprehension the statement that "orthodontic operations are accompanied by tissue disturbance however slight; they might be described as producing a mild degree of trauma." Any growing organ in a child is at a great disadvantage as compared with the adult; the very immaturity of these structures renders them more easily overcome by injury, despite their great capacity for recovery. No appliance on the teeth is without the possibility of detrimental influence; the most skillful operator can-

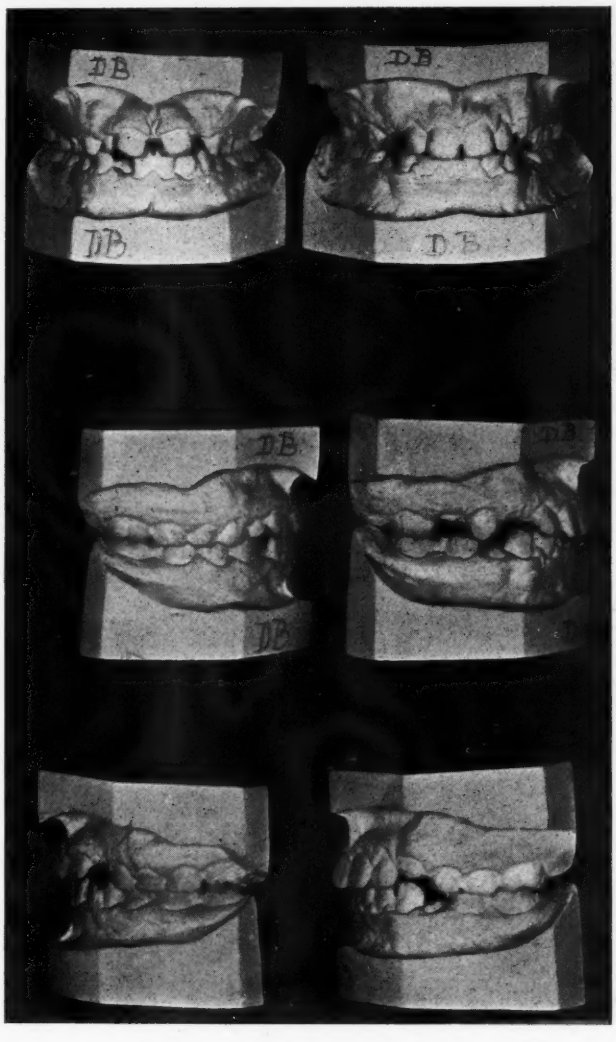


Fig. 5.—Incisor space closing.

not avoid an insult to these tissues if blind to the physiologic principles involved in the changes and nutrition of these parts, and if he thinks and acts solely in terms of technic. Again, in the idea of overcorrection;—I am quite aware of the orthopedist's efforts to correct certain structural deformities, such as scoliosis, where an overcorrected position is maintained for a period; but is this comparable to the condition adduced in the jaws, where an expansion and attenuation of tissue beyond the physiologic requirements is attempted?

The question of age for orthodontic treatment is inseparably linked with that of diagnosis, and it seems as unreasonable to set an age for it in chronologic time, as it would be to set a date for cutting your hay; you cut it when it is ripe, and the seasons vary—so do the children. In the presence of Dr. Chapman's overwhelming arguments in favor of

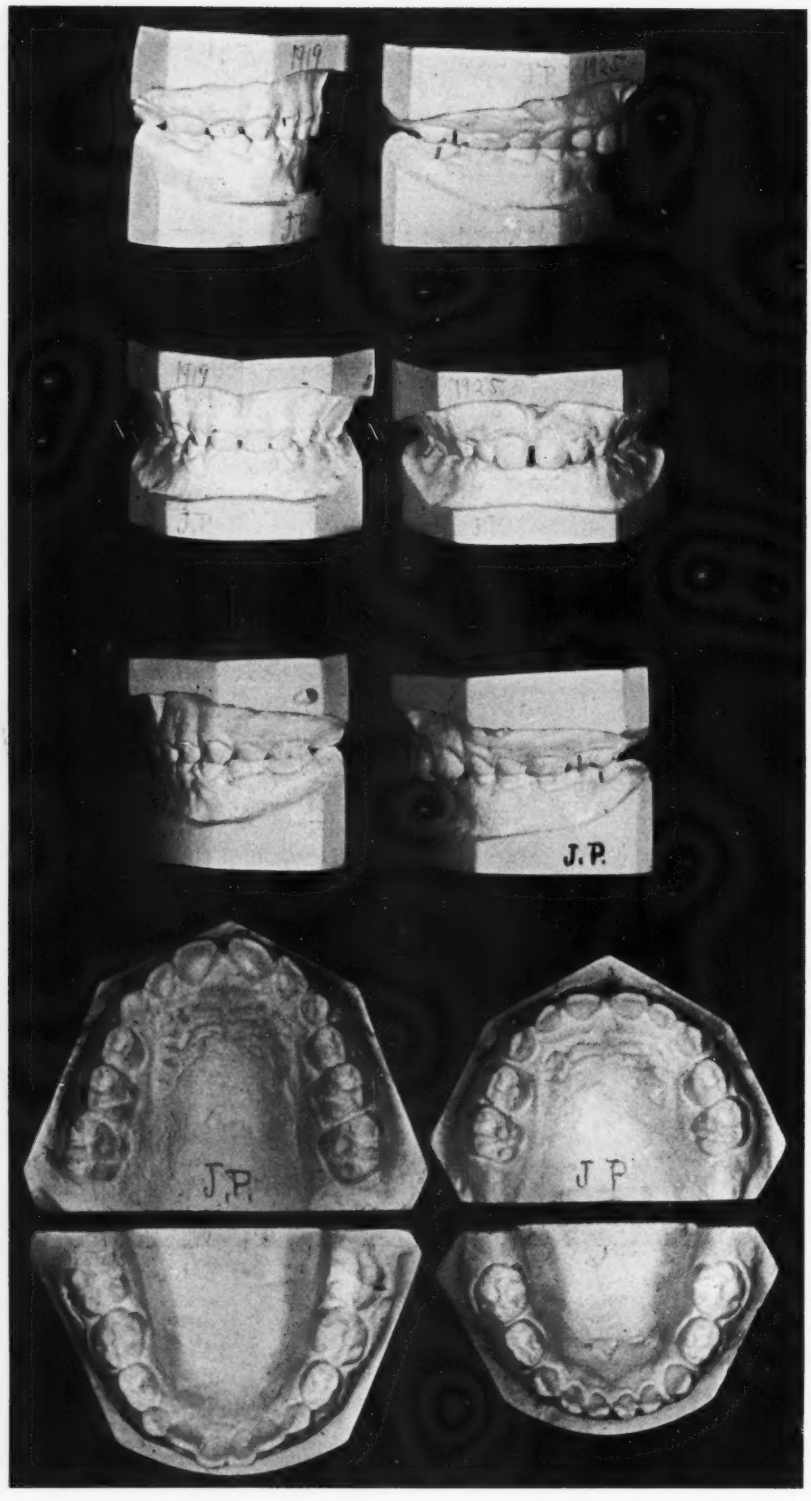


Fig. 6.—Deciduous molar, width at six years of age, 30 mm.; teeth well spaced. At eight years of age, a distoclusion.

early treatment, we must not allow our enthusiasm to dim our perception of the present limitations of our knowledge of development.

What should give us the most concern, it seems to me, is that we are sailing in uncharted waters. The rapid drift into this new territory has found us without much in the way of a compass; even the old map of "normal occlusion" is not as dependable. In order to measure up to the standard prescribed by modern medical thought, the orthodontist has been obliged to plunge into a strong and irresistible current in medicine which is



Fig. 7.—A distoclusion at six years of age. Normal occlusal relations at eight.

steadily moving from the obviously pathologic towards the more physiologic conditions, and, sink or swim, he must subscribe to the irrefutable dictum (to quote Dr. Chapman again) "if benefits are derivable from any treatment, these benefits should be available at the very earliest moment." One would suppose the answer to the question, "when to treat," was answered in the above-quoted dictum; it is evident the problem is not so easily disposed of, for Dr. Chapman says there is still no collective agreement; there may be general agreement on the point of "the very earliest moment" but "what age is that," is asked.

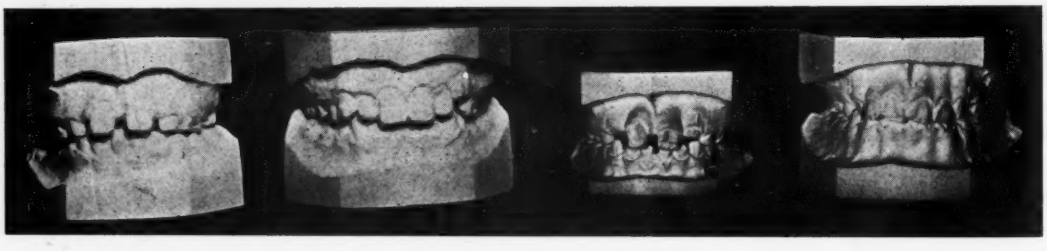
It may be helpful to suggest briefly some of the circumstances opposing the advent of the idea of early treatment.

First.—The rank and file of the dental profession has long concerned itself solely with the diagnosis of malocclusion as it manifests itself in the *later* stages. At such a time there is likely to be a deformity present which is easily recognized; the alignment of the teeth may have so far departed from what the typical is assumed to be, that a diagnosis of malocclusion may be made with a fair degree of accuracy. A familiarity with the typical arrangement and appearance of the *adult* denture has fostered the idea that the whole thing was a concrete problem of structure and adjustment, as simple as the mechanism of a wheelbarrow,—put the parts together and the necessary conditions of normality were satisfied. Is there anything in such a conception to suggest the advantages of early treatment? Is it likely that any great consideration would be given the conditions responsible or favoring the development of the malocclusion, when satisfied with that conception, and treating the child at a period so remote from the beginning of things?

Second.—There is an incident in the affairs of the orthodontist, seldom spoken of, that may be mentioned as responsible to the opposition expressed when early treatment is advocated.



Fig. 8.—Excessive overbite at seven; normal at fourteen.



A *B*

Fig. 9.—Note closing of incisor space in both *A* and *B*.

The source of supply to the orthodontist is the general practitioner, and there can be no doubt that he has frequently withheld treatment until the later stages of deformity have developed, because of the opportunity he has of seeing the final results of the orthodontist's efforts, even in those cases where treatment was begun early. Here they come finally to reside in the charitable confines of his practice, and it may be a mistaken charity that prompts him to hide many an unfulfilled promise, and never by any chance inform the orthodontist of his failure.

Third.—There is a traditional belief as old as medical history which contains a great deal of truth,—that children often outgrow all sorts of disorders both functional and structural.

> Holt, whose authority is unquestioned, says: "The extent to which the lesions resulting from serious organic disease in early life may disappear because of the changes that take place in the different organs and structures of the body as a consequence of time and growth, has not been sufficiently taken into account in prognosis."

Investigations have shown that the brain attains nearly its full thickness at about the fifteenth month (Donaldson and Sugita). Holt says he has seen extraordinary deformities of the skull disappear before the second year of life, the changes taking place as a result

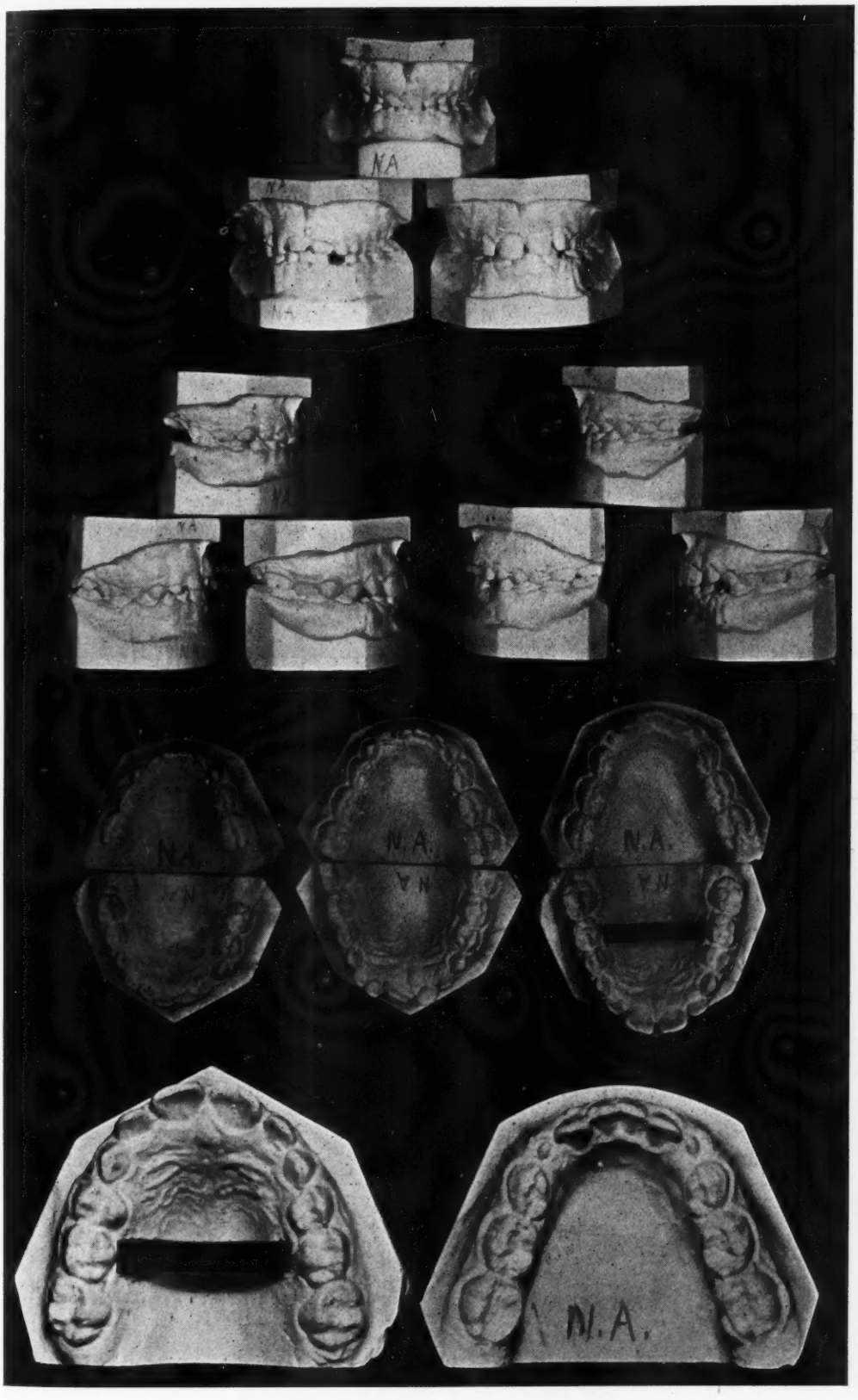
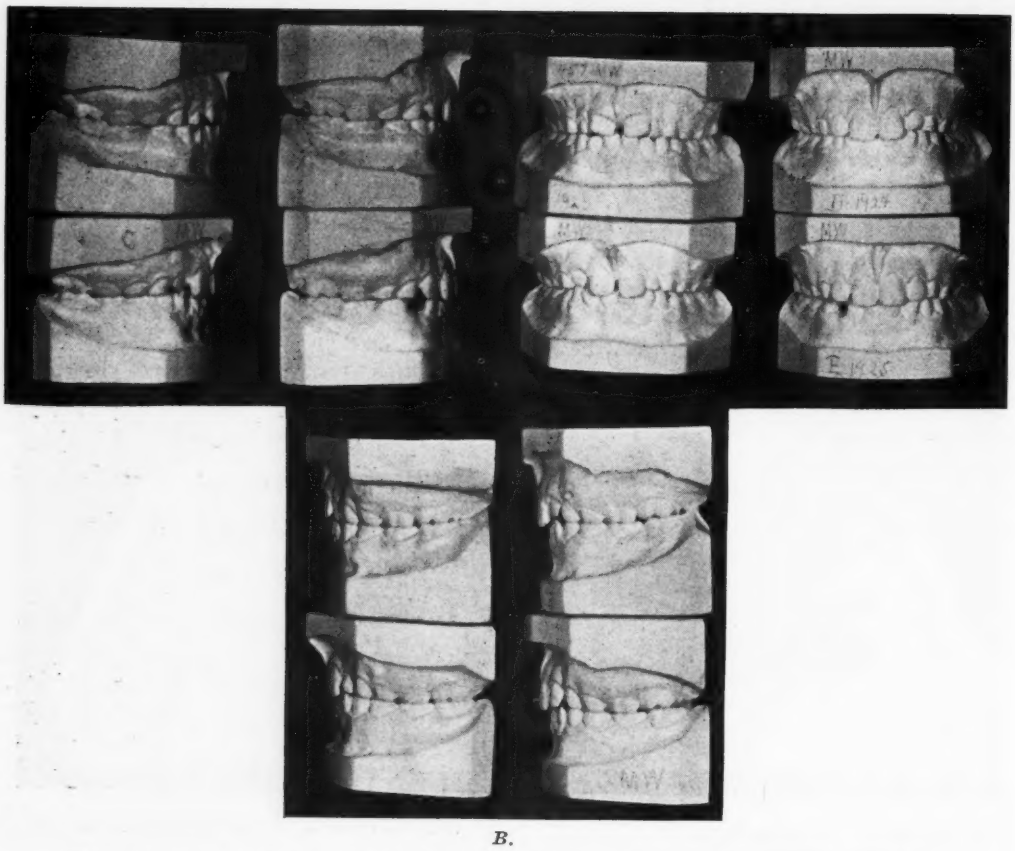


Fig. 10.—Deciduous molar width at six, 27 mm. Note slight change at eleven.



A.

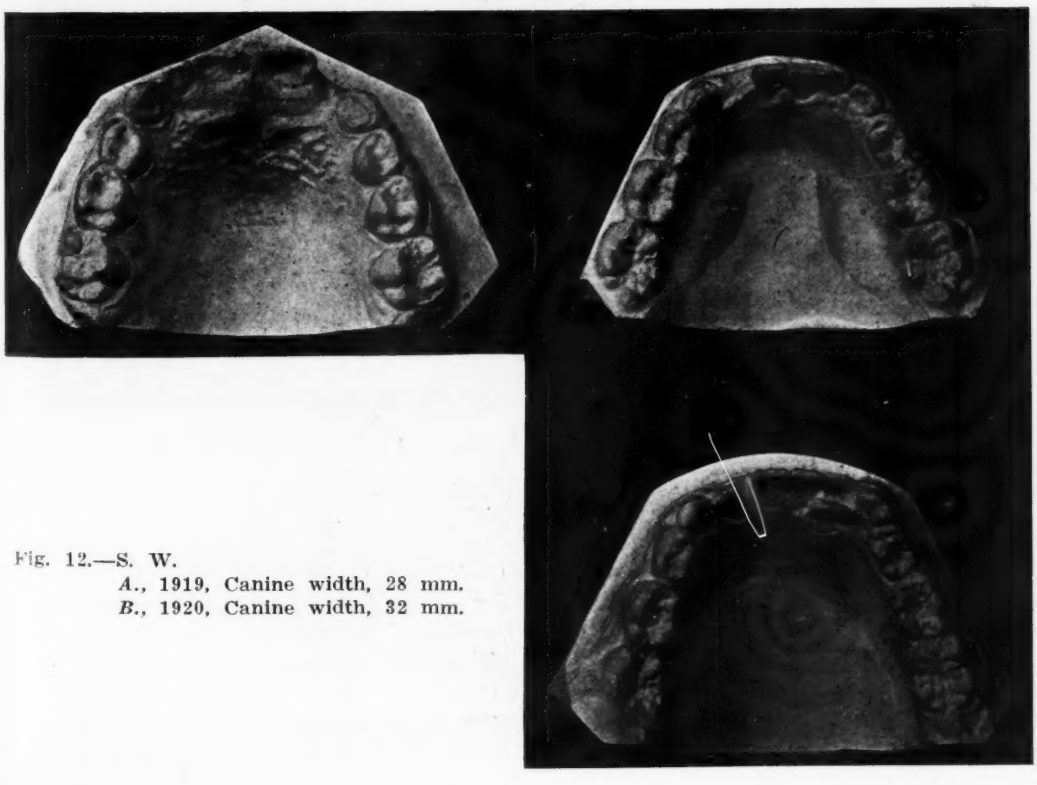


B.

Fig. 11.—Note closing of incisor space on the eruption of the permanent laterals.



Fig. 11-*C*.



A

B

Fig. 12.—S. W.
A., 1919, Canine width, 28 mm.
B., 1920, Canine width, 32 mm.

of this early completion of the brain's fundamental morphologic organization. He mentions the distorted chest walls that correct themselves as the lungs grow larger and stronger. "As growth takes place, the skull conforms to the shape of the brain and the chest to that of the lungs, not the reverse, as is often thought to be the case," he says. As the same holds true of the denture, the orthodontist has frequently "put the cart before the horse." When such great and almost unpredictable changes can take place in this period of most active

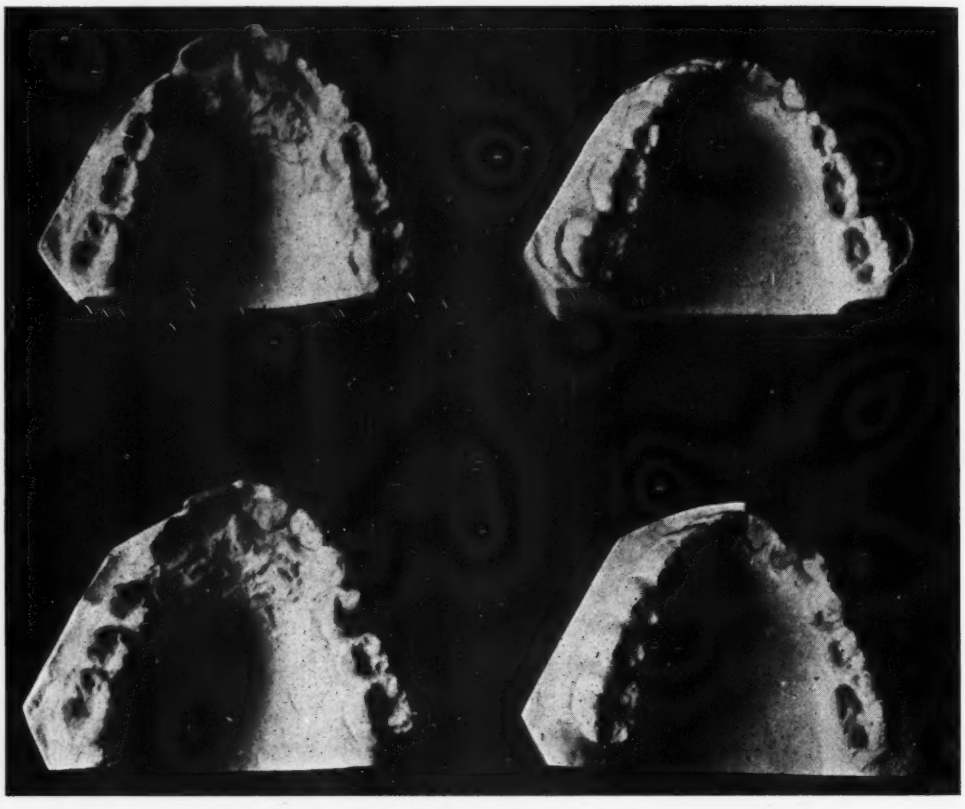
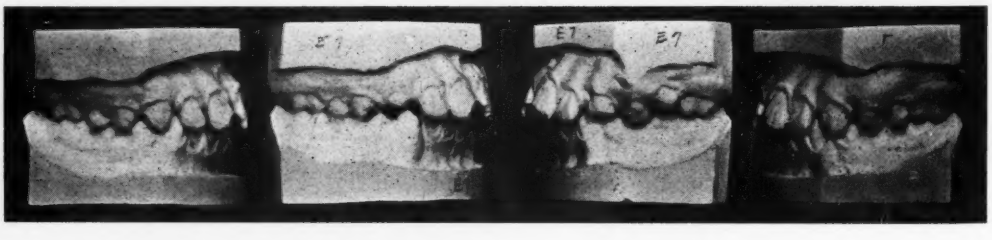


Fig. 13.—N. B., age six, deciduous canines, 25 mm.; age nine, permanent canines, 27 mm.



B *A* *A* *B*

Fig. 14.—*A*. Changed occlusal relations of maxillary first premolar. *B*. Note adjustment of premolars.

growth, the necessity of serious consideration of these observations becomes apparent; shifting as we have, from the late to these earlier stages of development, it raises questions which contribute distinct complexities to the question of the age to treat. Obviously, to treat before the disease is identified is not a rational therapeutic procedure. The decision we have most frequently to make is,—to treat or not to treat.

It seems to me unfortunate that Dr. Chapman should have selected cases so admirably suited to support his arguments for early treatment, but help us very little to agree upon



Fig. 15.—*A*. Closed incisor space. *B*. Movement of mandibular incisors. *C*. Occlusal relations of maxillary first premolar. Compare with Fig. 13.



Fig. 16.—*A.* Shows changed inclination of maxillary incisors. *B.* Increase in width of arch 1-6. Mandibular first deciduous molars 4 mm. Maxillary second deciduous molars 3.5 mm. Maxillary first permanent molars 2 mm.

the age to treat, where the signs are much less distinct. Under the heading "General Considerations" the essayist says, "I am one of those who believe that all cases, almost without exception, are in being not later than two years of age; I also believe that many of them have their origin at a still earlier age. As a consequence of that belief, it is my opinion that treatment for such cases should be undertaken at the earliest age possible, say at three years, but if this is impracticable, I do not think it need be delayed beyond six years of age." Suppose we grant that almost all cases of malocclusion are in being before the age of two; grant even its presence in the germplasm of the grandparents: it must at the same time be admitted that *all* children will not be afflicted with malocclusion: how then are we to distinguish the one from the other?

Dr. Chapman's cases at an early age appear to show conditions unfavorable to normal development; but shall we advise the expansion of every child's jaw at four or six years because it appears inadequate for the arrangement of the permanent teeth, or because it falls short of an anthropologic norm?

We do know that jaws grow larger, and that more than *one* direction of growth must be considered. Spaces between the permanent incisors frequently close without any interference whatsoever. Cases of distoclusion at six, may have normal occlusal relations naturally restored at eight.

The illustrations to follow will show, not simply the possibilities of a faulty diagnosis and unnecessary treatment at this early age, but the necessity for an intelligent association of the manifestations in one case with the recollections of what has occurred in others, before many questions relative to the age to treat can be settled.

These observations of *development under natural conditions* can no longer be termed "exceptions";—they are more significant;—they show the tendency in development to move in the direction of typal form.

Dr. B. Frank Gray.—If I were to give my views on this subject, I would be simply giving what I have already prepared as a discussion of Dr. Subirana's paper, so that I will not need to take the time to do that. I want to compliment my friend, Dr. Chapman, on his presentation. I do feel that this subject of treating very young children's dentures has been overstressed. I think it takes a man of discrimination and judgment to know what to do and when to do it. I just would like to send out a little warning note because I believe it is being overdone. I consider it an extremely difficult task to properly treat a child's denture, and I think we are giving the wrong impression too often to parents when we take these very young children. I think we should have it very distinctly understood that while we are attempting a certain preventive procedure, there are many, many chances that the child will certainly need to go for orthodontic treatment at a later period in life, and certainly we know enough now to feel that we do not want to keep orthodontic appliances in that child's mouth during its whole period of development. I just want to send out a note of discrimination and judgment.

Dr. Harold Chapman (closing).—I think that we should heartily congratulate Dr. Hatfield on his good judgment in not treating those cases which he has shown us. I very much regret that the time is so short that we could not have longer to study them. They are a great object lesson, and from my own point of view, if my paper has done nothing else, it has enabled me to see some of these cases which one has heard so much about, those cases which develop into good occlusions at a later stage.

From Dr. Hatfield's discussion, I do not think that we are personally very much in disagreement. I certainly am in agreement with him that I would not treat the cases that he had on the screen. I think I made that amply clear in my paper when I referred to the disadvantages which must occur from any treatment at all. I am glad that he agreed with me that the cases that I showed did not need treatment. I thank you very much for your kind attention.

ENDOCRINODONTIA

LECTURES READ BEFORE THE DEWEY STUDY CLUB

BY DR. DAVID M. KAPLAN, NEW YORK CITY

Lecture III

AT THE end of the eighth week of intrauterine life we find the first cells belonging to the thyroid proper. These cells will form the isthmus and the major parts of the thyroid gland. The origin is hypoblastic, whereas the connective tissue and vascular strucures in this organ are of mesoblastic origin. During the growth of the embryo small buds or thyroid islands detach themselves and later in life play the rôle of accessory (or auxiliary) thyroids. Although resembling the tonsils and thymus, they are not metamorphosed into a lymph-like structure. The early appearance of the thyroid in embryonic life reflects upon its importance and great necessity to further the growth of the future organism.

The axolotl, which is an amphibious animal, can be changed into a purely terrestrial, lung-breathing organism by early thyroid feeding. The earliest representative of the chordates (vertebrates) according to W. H. Gaskell is the lamprey. The immediate archaic predecessor of the lamprey is a Silurian arthropod, of which the scorpion and the horseshoe crab are the contemporaneous survivors. The ancient arthropoda are grouped under one designation, "Palaeostraca." Among these Palaeostracan ancestors of the chordata are to be found examples where the thyroid and the uterus are continuous tissues, being situated near the cephalic extremity.

In the process of evolution this continuity became interrupted, the genital apparatus finding an outlet in the posterior region of the body.

The following statement is from Gaskell: "I can only suppose that the reason the thyroid gland has persisted throughout the vertebrate kingdom, after the generative tissues found a new outlet for their products, in the body cavity of the posterior region, is because it possessed some important function, a function essential to the well-being, or even life, of the animal."

Were it not for my intention to make you *understand* and *think,* rather than merely *know* endocrinology, I would have omitted this embryologic and palaeontologic introduction. All you need to know is that the thyroid is important to the developing embryo on the one hand, and on the other, that at a remote age the thyroid and the uterus were continuous structures in some of our extinct predecessors. Knowing this, you will understand later why Dr. Joseph Fraenkel stated that no gonadally complete male can ever develop a true Basedow or exophthalmic goiter.

Suffice it for the present moment for you to carry away the impression that the uterus must be reckoned with in thyroidal states, in which very often this gland assumes an activity which renders the individual inadequate to cope with even slight exertions, on account of the cardiac connection with the thyroid secretion.

Over 85 per cent of patients with exophthalmic goiter are females, and according to Dr. Fraenkel, the remaining 15 per cent are inadequate or incomplete males. Subtract from this 15 per cent, a goodly number that are formes frustes of the disease, and you will readily recognize that an abnormal femininity, and in this particular, disease of the uterus, is almost a sine qua non of the true Basedowic syndrome.

I believe that the term physiology, or chemistry, would not cover the activities of the thyroid gland in the human body. Its interactions are so varied and manifold that I consider the term "biodynamics of the thyroid" a necessary designation of the sum total of its functions.

Although the proper function of the thyroid is essential to perfect health, it may be biodynamically imperfect, and yet not give rise to an increase or diminution in its bulk. Its entire abnormal trend may be manifested by subjective phenomena only. And yet it may become enlarged, as in the periodic menstrual flux, or as in the case of the man with the pituitary disease, in the photograph,* without requiring much medical attention.

As in the case of the pituitary, whose appanage is bulk and rhythm, in the thyroid we have a regulator, or a maintainer of equilibrium. Endocrinotropically speaking, the thyroid gland is an equilibrizer of endocrine activities "par excellence." A regulator, and equilibrium maintainer, and controller of functions, a perfect thyroid gland is a "consummation devoutly to be wished." Not only are the endocrines and other functions properly dovetailed in their interactions, but the human organism as a result of such an equilibrium presents a distinct aspect. Such a person is usually good looking, with large bright eyes, a clean, smooth skin, good teeth, soft silky hair, and an intelligence which takes in everything at a glance. Besides this, such fortunates throw off diseases with remarkable ease.

As you see, good quality of the cells making up an organism and a perfectly functioning thyroid go hand in hand. We therefore have two patterns, equilibrium and quality, as tropic appanages of thyroidal activity.

The functional messengers of the thyroid gland are purely chemical in nature, and to all intents and purposes do not require the rails of the nervous system to travel upon. In proof of this I will cite a simple experiment. A dog, whose thyroid gland was entirely removed, had upon recovery from the operation, another thyroid gland engrafted into his abdomen. The graft took, and no manifestation of discomfort could be detected in the animal.

Of course, endocrine objectors, physiologists, and other doubting Thomases, could offer an objection in that there may have been aberrant thyroids present in this dog. However, when the graft of thyroid tissue was removed from the above animal, he promptly died from a cachexia strumipriva.

The above experiment safely excludes the nervous element as a highway of thyroidal traffic. Its endocrine activities are purely humoral, and though its manifestations are in a large measure neurotic, it is so only because of the humoral change affecting the nerves in an adverse manner.

Of all the biochemical molecules in the thyroid household, the rôle played

*See Lecture I, photographs 3, 4, 5, January issue.

by molecules containing iodine is best known. Long before chemists proved the existence of this element in appreciable amounts, iodine feeding was considered as an efficient method of curbing some dysthyroidal misbehaviors. At any rate, drugs or endocrine substances containing iodine are very efficient and satisfactory medicinal agents where the gland is dormant, lethargic, or deficient.

Its hyperactivity is by no means as easy a task to curb as its underactivity. Whereas a well-established clinical hypoactivity is as different from hyperactivity as day is from night, its incipient manifestations often escape the searching eye of the doctor, and, alas, of such is the vast majority of suffering which comes to a physician without having been endocrinally interpreted.

How many physicians note a slightly deficient eyebrow, and correctly interpret this objective sign of hyperthyroidism? How few there are, alas, who know that uncontrollable gas formation is a pituitary concomitant of overactivity followed by an exhaustion of the pituitary.

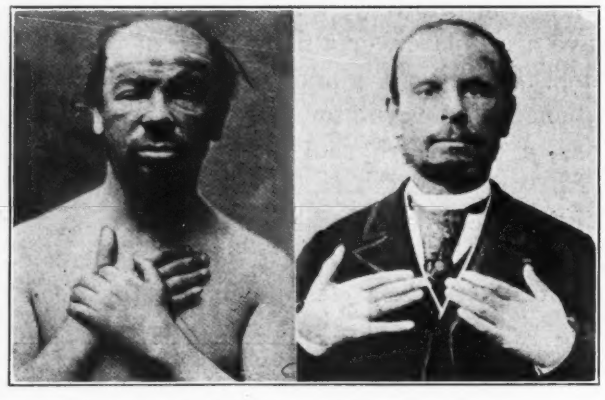


Fig. 6.—Thyroid insufficiency before and after treatment.

I will be rewarded indeed, if I may be able to say that at least you, gentlemen, know. As indirect as the relationship between the eyebrow sign and the thyroid gland may be, we must not forget that no cell, whatever its nature, and no group of cells, attain the morphologic completeness necessary to the perfect accomplishment of their functions unless they are adequately supplied with a certain essential quantity and quality of thyroid secretion.

All you need in order to impress indelibly upon your minds this near axiom, is to view the offered photographs (Figs. 6 and 7).

In all thyroidal manifestations the misnomers of myxedema, Graves' or Basedow's disease, hyperthyroidism, etc., will have to be discarded, for they only confuse and prevent a true conception of these disorders. The term tropism is more happily fitting to thyroidal occurrences than to other endocrine states. We will therefore confine ourselves to "thyrotropism," be it an under- or an overacting error of this gland or its associates. And when I say associates, I mean that no tissue or group of cells capable of sending an internal secretory product into the blood stream does so without it being checked up by the thyroid gland.

For this reason, and many others, I believe that the term "regulator," or "equilibrizer" fits the thyroid preeminently.

When one studies the thyrotropism of Basedowics one wonders where the villain of the melodrama is to be sought. But Pandora's box has been opened, and we justly arrive at the conclusion that the female sexual organs hide the villain in their recesses. For do we not know that most Basedowics are women, and are we not also informed that during puberty, during menstruation, pregnancy, and sexual excitement the thyroid enlarges? Of course in the last four manifestations the enlargement and the overaction are only temporary, but when the phenomenon becomes more and more permanent then we have disease in its beginning, still in a dynamic form, in a fluid, chemical dysbalance. Upon the heels of these unwelcome heralds, pathology enters.

Now, to elucidate the tropisms of the thyroid. I shall give these also in table form, beginning with the indices of hypofunction.



Fig. 7.—Thyroid insufficiency before and after treatment.

HYPOTHYROIDAL TROPISMS

Subjective:

A general feeling of chilliness.
Great consumption of candy or sugar.
Drowsy in early evening—loves his bed.
Happy go lucky—or sluggish mentality.
Occasional precordial pain radiating to left shoulder.
Very little sweat, but when present very noticeable.
Hands and feet cold at night.
Mild form of mental apathy or depression.
Menses irregular.

Objective:

A tendency toward obesity.
Acroedema.
Malar prominences puffy and a capillary injection.
Voice thick and hoarse.

Skin thick, tight, lacks luster, pasty, putty-like color, dry.
Lower molars much decayed, usually bilateral.
Lunula or nails absent. Nails stumpy and broken.
Ocular expression dull.
Eyes deeply set—lusterless.
Hands chilly and clammy. Flat feet.
Hair falling out in handfulls.
Alopecia areata—and dandruff.
Sluggish vasomotor skin reaction.
Blood pressure normal or slightly below.
Mucous in stool—erroneously diagnosed as mucous colitis.
Metabolism diminished.

HYPERTHYROIDAL TROPISMS

Subjective:

A feeling of warmth (wearing low cut dresses in winter).
Do not feel the absence of sweets, take coffee minus sugar.
Hate the bed, cannot sleep.
A quick mentality, constantly on the alert.
Cardiac distress, worse at night.
Profuse sweating, in showers, plus exhaustion.
Body and extremities aglow.
Outbursts of uncontrollable temper, followed by remorse.
Menses premature, profuse.

Objective:

Difficult to gain weight.
Shapely hands, feet and ankles.
Voice clear, bell-like, and carries far.
Skin fine, transparent, showing veins, smooth, moist and warm. Hands long and graceful, nails pointed.
Teeth in a very fine condition as to color, shape, implantation, and occlusion. Color bluish white.
Ocular expression bright, eyeballs large and prominent.
Hair fine, silky, long, can hardly be felt between fingers.
Rapid vasomotor skin reaction.
Blood pressure minus as a rule.
Metabolism increased.

There are volumes devoted to the study of the thyroid and its tropic indices, but, as you are only interested from the dental angle, I will make an attempt to clarify some of the above manifestations and point out to you what one can do with them.

The stunted growth of the skeleton, as shown in the picture of the cretin (Fig. 8), will make you think that there is something wrong with the proper use of the materials which are necessary to bone formation. How necessary proper thyroid activity is to this phase of life can be seen by the results obtained from feeding thyroid to the above patients. Of course, should ossification

of the epiphyses be complete it is too late for us to attempt to increase the height of the individual. If deciduous teeth are still present we can hold out some hope, as they are an index of delayed maturity.

Although the thyroid activity has directly nothing in common with "bulk," yet, when its functional display is defective, particularly in the pregonadal period, growth is apt to be stunted. In the cretin the lack of growth is principally noted in the limbs, and one may reasonably conclude that the thyroid has a special influence upon the ossification of long bones, and in some way enables the body to use up the available calcium supplies. Normally dynamic thyroids will accomplish this, together with an interactive



Fig. 8.

partnership with the other endocrines. Hypo- and hyperactive thyroids offer an obstacle to proper calcium metabolism, as shown by laboratory analyses of the urine.

Coagulation of the blood is interfered with, and we may have a thyrogene metrorrhagia or an uncontrollable epistaxis, or an urticaria, or bruises upon the slightest injury.

In dental caries I believe we are dealing with an inadequacy in the supply of calcium and associated elements in the saliva, as well as in the body in general. Normal saliva has a certain percentage of alkalinity, which varies in health and disease. The alkalinity is sufficient to neutralize any acid products

of fermentation arising from bacterial decomposition of food products. You will agree with me when I say that the primary stage in dental caries is decalcification of the enamel by acids, arising in the above-mentioned fashion, provided the individual is otherwise susceptible. Were the saliva sufficiently charged with calcium bicarbonate, and its alkalinity maintained, such deleterious injury to the enamel could not have taken place in such a susceptible.

It is to be observed that the lower front teeth, from their position, are constantly bathed in saliva, and are relatively immune from dental caries. Of course you will say their shape has a great deal to do with that, as they offer few hiding places for decomposition products to accumulate. But you will also admit that their corresponding upper teeth, of almost the same shape, but not so constantly in contact with the alkalinizing saliva, are more often susceptible to caries. Submaxillary saliva is richer in calcium salts than the parotid, and when a shortage of calcium salts occurs, the parotid saliva is influenced more and the posterior teeth are the first to decay.

In many instances, and particularly in children, having noted your tropism carefully, you will be able to restore the oral alkalinity with small doses of thyroid extract.

An endocrine factor is responsible for the tardiness in erupting teeth, for malposition of teeth, for irregularity in the dental arches of children, all of which are outposts of hypothyroid tropisms, and are in my mind a form of oral rickets.

In this connection I wish to emphasize particularly the point of endocrine interaction. The thyroid in itself or alone could not accomplish much in the above-given calcium difficulty; it most likely wakes up or increases the working capacity of the gland or glands which are real calcium endocrines, such as the thymus in children and the gonads in the adult. Again remember that the appanage of the thyroid is "equilibrium and quality," and its power to maintain an equilibrium often requires its use in small doses.

If I were given the choice of selection from the entire gamut of endocrine drugs only one representative I would unhesitatingly choose thyroid extract. The manifold display of symptoms which come under the heading of neurasthenia, hysteria, epilepsy, rheumatism, psychasthenia, etc., are impenetrable cloaks to hide the doctor's ignorance. It is Dr. Jekyll hiding Mr. Hyde. For no greater harm can be done to a psychoneurotic display of hypothyroidal dynamicity in a forme fruste myxedema than to prescribe for them bromides, valerian and other nondescript junk. So many beginning inconveniences could be regulated by the timely administration of thyroid that I very often begin treatment with a small and infrequent display of this extract. I never did harm pursuing this policy, and very often indeed had results which astonished me, my patient, and the doctor who sent the case.

Furthermore, in my therapeutic studies I have come across drugs which, though having no direct significance in abating the thyroid storm, nevertheless proved of immense value in overcoming some of its most disturbing elements. Everyone knows with what difficulty the hyperthyroid tachycardia, the progressive loss of weight, is amenable to treatment. But thyroid extract in homeo-

pathic doses, 6x, tablets every two hours, for two weeks, will produce a change for the better. If you get a chance to read the therapeutic provings of Lilium tigrirum and spongia, you will find more of the hyperthyroid symptoms described, and strange to say, the homeopathic descriptions are by far more complete than any allopathic attempt.

The reason spongia works so admirably is that, being a marine phytozoon, and constantly coming into contact with the halogens of the sea, such as iodine, etc., this iodine being in an organic combination works much more potently and directly than any iodine preparation made artificially.

And here in my opinion I will not only advise, but most imperatively insist that you use cod-liver oil, in any and every case which displays one or more tropisms of hyperthyroidism. In my conferences with you, gentlemen, I must pick out cod-liver oil as the almost panacea in dealing with an overactive thyroid gland. Begin with a teaspoonful, and get the patient used to it. Gradually increase the dose up to three or four tablespoons a day, and dismiss the old woman who advises against its use in the summer. With it give spongia 3x, one every hour, and keep it up for a month. If you find no improvement, do not blame the drugs, but rather your diagnostic designation.

Do not be carried away by my enthusiasm, and do not for a moment believe that I am, endocrino-therapeutically speaking, a wizard. Such failures as I had were due in the beginning, first and foremost, to lack of endocrine insight, and secondly to attempting to handle and cure pathologically and surgically altered patients. You cannot unscramble scrambled eggs.

I can see the remote future, when a wise expectant mother will have herself analyzed by a competent endocrinologist who will be able, at least I hope so, to direct the future destiny of her offspring. It has dawned upon society that certain married misfits should not be permitted to have children. This is a very un-Catholic, but economically sane, attitude. But there are situations where a proper endocrine régime during this delicate period could, and in my experience did, accomplish more than was asked of me.

Erratum

Article by John V. Mershon, "The Removable Lingual Arch Appliance," November, 1926, page 1006, 20th line (fifth line of tabulated matter), should read: The length of the half round tube _____ 10-one hundredth.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Actinomycosis of the Mouth and Neck. E. H. Thomas and A. K. Van Dusen (Chicago). The Journal of the American Dental Association, November, 1926, xii, 11.

This case report read before the American Society of Oral Surgeons provoked a full discussion which brought out other case reports by Hopkinson of Milwaukee, Gardner of the Mayo Clinic, and other participants. According to Dr. Arthur E. Smith of Los Angeles from 600 to 700 or more cases are now on record in the United States, about half of which had never been reported at the time of treatment but had been unearthed later. In not all of this large material was the jaw primarily involved but about 80 per cent of all cases have this origin. Cases must often be overlooked, for even with full laboratory facilities the ray fungus is often not found until after a number of slides have been examined. The great frequency with which the disease begins in the mouth makes the oral surgeon more responsible for keeping track of it than any other man, even the general surgeon. Dr. Gardner reported a case in which there was no inkling of the diagnosis until the pus was examined with the microscope and the condition suggested no more than an ordinary apical abscess. The authors of the paper report their case with great thoroughness, which drew forth praise from one of the participants of the discussion as something unusual before dental societies and it is true that cases are usually reported in too sketchy a fashion and that oral surgeons should make use of the same thoroughness in case reports as other surgeons. Photographs of Dr. Hopkinson's patient before and after treatment show the possibility of attaining first-class cosmetic results in these patients. She had no less than thirty discharging sinuses or fistulae and all but one of them closed under cataphoresis.

Etiology of Dental Caries. Editorial in the Dental Cosmos, December, 1926, lxviii, 12.

According to the editor this is unquestionably the most vital problem before the dental profession of today. Lack of progress is not due to lack of effort but rather to want of teamwork. The fact that caries could be obviated in a way by mechanical means has long kept the question of cause

and prevention in the background. Even now but few leaders of the profession concern themselves as to etiology. The pioneer effort does indeed go back forty years with Miller's chemico-parasitic theory but this passed largely unremarked and it is only today that Miller is recognized as an authority and his counsel followed. His views, however, have lacked corroboration for want of a suitable effort which was supplied with the establishment of the research commission of the National Dental Association. The work of Black introduced a new causal factor, the environment, which is a cyclical unknown quantity in virtue of which caries undergoes periodic fluctuations of incidence like the contagious diseases and which may have to do with the nature of the bacterial factor. While no specific bacterium of caries has yet been recognized there is much consensus of opinion that it is a lactic acid bacillus. Bunting has recently reported that in a study of 427 carious mouths he never failed to find this organism present. This, however, is but one of the factors in the genesis of caries, but it is a factor which can be duly antagonized by antisepsis and asepsis.

Infected Teeth and Group Medicine. B. S. Gardner (Mayo Foundation). The Dental Digest, December, 1926, xxxii, 12.

At the Mayo Clinic most patients with dental troubles have systemic disturbances and close cooperation with the physicians is necessary. If systemic disturbances are in any sense traceable to a pulpless tooth this is removed. The mouth is divided into sections and the teeth in each removed separately. After the first of these extractions the patient is studied for symptoms of a local reaction in the diseased member. Block anesthesia only is used in the interest of absolute safety. In removing difficult teeth a flap operation is first performed, the tooth delivered and the flap closed. In molar extractions the roots are first chiselled off and then delivered. The alveolus is let alone after extraction in the interest of formation of a blood clot. The use of the curette is forbidden unless some actual diseased tissue is present and then it is used with care. If the antrum is diseased the patient is turned over to the rhinologist of the group; the dentist should not fool with the antrum. The author closes with the statement that but few dentists have any conception of true surgical cleanliness. Many of their office operations should be performed in hospitals.

The Caries Problem. Nissle (Freiburg). Münchener medizinische Wochenschrift, October 29, 1926, vol. lxxiii, 44.

Dental subjects are seldom found among the original articles of the great medical weeklies and hence this contribution from Professor Nissle, the chief of the Hygienic University at Freiburg, should prove of interest. The author's own conclusions are as follows: Lactic acid bacteria as found in the mouths with carious teeth show a higher fermentative activity than the same organisms in mouths with intact teeth but thus far a specific bacterium of caries has never been shown to exist. The source of caries must therefore be found in the absence of some defensive substance in the blood serum of

the man with caries. Is this due in any way to soft drinking water? The author finds no evidence that hard drinking water is a preventive of caries. Bunting's experiments with rats are indecisive and do not show clearly that calcium in the diet can antagonize caries. Differences in the incidence of caries show some relationship to nutrition; heredity is a factor; coarse food, hard to chew, has preventive action in some way as in maintaining mechanical cleanliness. The author is an adherent of the teachings of Walkhoff on the causation of caries. Food should not be selected merely for its caloric or reconstituent value but also for its relationship to proper mastication. Mouth hygiene as a preventive of caries cannot offset the food factor for even in the total absence of care of the teeth we may see absence of caries. The author seems to sum the caries problem up in the advice to "eat for the teeth."

Toxicity of Amalgam. Hochradel (Berlin). Münchener medizinische Wochenschrift, October 8, 1926, vol. lxxiii, 41.

The author reports the discussion of this subject in the dental section at the meeting of the German Society of Naturalists and Physicians at Düsseldorf on September 25, 1926. The claim of Stock that the vapor from mercurial amalgam could cause nervous depression led to an open debate on the subject. Professor Dieck was the chairman and cited the case of a man whose nervousness was greatly improved by removal of his numerous amalgam fillings. In such a case however there must have been a special sensitiveness to the action of mercury vapor. The patient in the case was a noted scholar and these seems to have been no question of the correctness of the diagnosis of mercurial poisoning. Not only could there have been this special idiosyncrasy on the part of the patient but there was probably defective technic in handling the amalgam. Experiments undertaken to prove or disprove the correctness of Stock's view have shown that there is no necessity for any formation of mercury fumes in working with amalgam. The alternate speaker was Professor Citron of the Berlin University Medical Clinic who praised Stock warmly for bringing up the matter and for the thoroughness and conscientiousness of his research. He believed that this risk of amalgam poisoning is heightened in the presence of oral sepsis and pyorrhea. The sense of the entire session seems to have upheld the position of Professor Stock and the report shows no adverse criticism of him, such as obtained when his original report was first made public.

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EDITORIALS

The Orthodontist of the Future

THE November bulletin of the American Medical Association, which is the Official Journal of the House of Delegates, contains the following communication from Dr. James B. Herrick, entitled "The Clinician of the Future." We publish this communication in full because it deals with conditions that exist in the medical profession; and the same conditions, with slight modifications, are developing in the orthodontic profession.

THE CLINICIAN OF THE FUTURE

"I hope our future clinician will be under the influence of the spirit of research. Investigators, like Cicero's poets, are born rather than made, but they sometimes go undiscovered.

"It will be of advantage if our clinician is taught certain facts and methods by the all-time hospital clinician. The concentrative and intensive work in the one subject that I deem so important, the majoring in one topic, might well be handled by the one who has gone deep into the subject, as we expect the all-time teacher and hospital clinician to go, largely from the academic and so-called scientific side.

"But clinical medicine—using medicine in its broader sense as including medicine, surgery, obstetrics and the specialties—should also be presented to our students by the one who is himself a clinician, a practicing doctor. Such a teacher should be well informed as to facts, well trained as to methods. He must be an expert in the application of his knowledge in diagnosis and treatment. He is intellectually as scientific as his laboratory or all-time colleague. To immure oneself in a hospital or laboratory does not of necessity make a man a scientist. Nor does a man who engages in practice by so doing necessarily lose his scientific habits of thought. What I am pleading for is a teacher who is a practical clinician and whose art is based on a deep knowledge of fundamentals and principles."—James B. Herrick, M.D.

During the past few years the orthodontic profession has gradually been dividing itself into two groups as regards the fitness of the future practitioner of orthodontics. Some have contended that the future orthodontist should be a research worker trained along scientific lines with especial attention devoted to biologic subjects. In the minds of some, this plan of education has gone so far that they consider the study of mechanics in relation to the practice of orthodontics, as a weakness. In fact, they advocate teaching the future orthodontist everything except practical mechanical principles and the treatment of malocclusion by mechanical devices. On the other hand, there always has existed another group of practitioners whose training is purely mechanical; whose thoughts begin with appliances and end with appliances. They are, to a great extent, the result of the mechanical laboratory and the manufacturer of appliances. The appliance manufacturers appeal to the general practitioner by advertizing the practice of orthodontia as having great financial opportunities. Such a practitioner necessarily is unable to give the best advice or the best service to his patients, because of his limited knowledge of biologic sciences. However, we question whether he is doing any more harm to the profession of orthodontics or to the general public, than the ultrascientific man whose treatment of the case very often begins with the study of etiology and a diagnosis of the condition present, and ends with the advice that orthodontic treatment should not be instigated. During the past few years we have seen many such patients, who have been advised against orthodontic treatment by the ultra scientific orthodontist, and such patients have afterwards received treatment which has greatly benefited their conditions. We realize however, that a great many of these cases have been advised against treatment not entirely because the man was ultrascientific in regard to biologic subjects, but because he also was deficient along mechanical lines. He probably should not be termed a scientific orthodontist but a selective orthodontist. By selective orthodontist, we mean the

man who selects to treat only the easy and simple cases, including such conditions wherein he is assured a 100 per cent success; leaving untreated those cases of greater deformity which show a masticating inefficiency and abnormal development with a deformity which may be classed as a 30 per cent normality. In these extreme conditions, we realize that 100 per cent result is impossible. However, these extreme cases can be brought from the approximate 30 per cent efficiency to a 90 or 95 per cent normality, which is an improvement the patient is entitled to. Some practitioners contend they have the liberty of treating such cases as they desire and refusing cases they do not wish to treat. From the selfish and personal standpoint of the practitioner, that is probably true, but when we consider the broader side of the profession, it is the duty of the professional man to do what he can for the patient and render the best service possible, before he considers his own personal wishes in the matter. We have known of surgeons who follow the policy of refusing to operate on patients whose conditions do not indicate a satisfactory recovery, so far as they are able to prognose the case. In other instances, where the patient's chance for recovery is only one out of four, these surgeons refuse to operate because they do not want to take the chance of the patient dying after the operation. Such an attitude prevents the patient from taking advantage of the small margin he has for recovery. Of course, we realize the treatment of a case of malocclusion is not an immediate life or death matter. The benefits derived from orthodontic service make the treatment of a case of malocclusion much more important from the standpoint of the patient than some men would be willing to admit. The orthodontist who refuses to treat a case because it is difficult and the prognosis does not promise a 100 per cent result, is not fulfilling his professional obligation. The orthodontist of the future, like the clinical medical man as outlined by Dr. Herrick, must necessarily be one who has a knowledge of the scientific subjects but who also has sufficient mechanical skill to make valuable his biologic information. At the present time, we must remember that orthodontics is a mechanical interpretation of a biologic problem and as long as bone develops as a result of mechanical stimulation, mechanics will always be a necessary part of orthodontic practice.

ORTHODONTIC NEWS AND NOTES

Seventh Annual Meeting of the Southern Society of Orthodontists

The seventh annual meeting of the Southern Society of Orthodontists will be held February 28, March 1, and 2 at the Battery Park Hotel, Asheville, North Carolina. The program follows:

Monday, February 28, 1927

Morning Session

9:00 Invocation.
G. Floyd Rogers, Asheville, N. C.
Address of Welcome.
B. F. Hall, Asheville, N. C., President of North Carolina Society.
Response to Address.
Oren A. Oliver, Nashville, Tenn.
President's Address.
Harry A. Holder, Nashville, Tenn.
Business Session.

10:00 The Advantages of Radiographic Examination in Orthodontics.
Clarence O. Simpson, St. Louis, Mo.

11:30 The Growth of Bone in Relation to Function.
Egon Neustadt, Vienna, Austria.

12:30 Adjournment.

Afternoon Session

2:00 The Value of Early and Scientifically Correct Diagnosis of Malocclusion as Compared with Experimental Diagnosis.
Harry E. Kelsey, Baltimore, Md.

3:00 Pediatrics in Relation to Orthodontics.
L. W. Elias, Asheville, N. C.

4:00 Radiographic Technic.
Clarence O. Simpson, St. Louis, Mo.

5:00 Business Session.
Adjournment.

6:30 Dinner.
Topic Discussion.
Clinton C. Howard, Chairman.
The object of the Topic Discussion is to give the members an opportunity to present any questions they would like to have discussed. Therefore, if you will forward your questions to Dr. Howard in advance of the meeting, they will be answered at this time. "If you have any troubles, here is a good place to have them cured."

Tuesday, March 1, 1927

Morning Session

8:45 Mouth Breathing.
H. H. Briggs, Asheville, N. C.

9:45 Election of Officers.

10:00 Symposium: Recent Progress in Diagnosis and Treatment of Dental Anomalies.
B. E. Lischer, St. Louis, Mo.
C. A. Hawley, Washington, D. C.
Brief Historical Résumé—Lischer.
Technic of Gnathostatic Impressions and Models—Hawley.
Technic of Photographs—Lischer.
The Drawing of Graphs—Hawley.

12:00 Adjournment.

Afternoon Session

1:00 Golf Tournament at Asheville Golf and Country Club.
Sightseeing Automobile Rides over Asheville.

7:30 Banquet at Asheville Golf and Country Club in honor of Essayists and Clinicians.
Harry E. Kelsey, Toastmaster.

Wednesday, March 2, 1927

Morning Session

9:00 Standardization of Appliances and Treatment of Unilateral and Bilateral Posterior Occlusion.
Martin Dewey, New York City.

10:00 Symposium: Recent Progress in Diagnosis and Treatment of Dental Anomalies.
B. E. Lischer, St. Louis, Mo.
C. A. Hawley, Washington, D. C.
Metric Methods Applicable to Gnathostatic Procedures—Lischer.
Study of Facial Forms and Types in Relation to the Orbital Line—Hawley.
Classification and Differential Diagnosis—Lischer.
Treatment of Maxillary Protraction and Retraction—Hawley.

11:30 An Original Method of Constructing Extraoral Anchorage.
Clinton C. Howard, Atlanta, Ga.

12:30 Adjournment.

Afternoon Session

2:00 Case Reports.
No. 1.
J. E. Brown, Jr., Mobile, Ala.
Supernumerary and Missing Teeth.

No. 2.
H. E. Kelsey, Baltimore, Md.
Case Report.

No. 3.
H. C. Shotwell, Lynchburg, Va.
Models Before and After Treatment of Distoclusion of Four-Year-Old Child.

No. 4.
Clyde O. Wells, Spartanburg, S. C.
A Method of Canine Rotation and an Unusual Case of Trauma.

3:00 Clinics.

No. 1.
Winston P. Caine, Chattanooga, Tenn.
An Appliance for the Apical Movement of the Roots of Incisors and Canines.

No. 2.
Harry E. Kelsey, Baltimore, Md.
Making Gnathostatic Diagnosis Impressions and Models, Showing Extra Time Consumed is Negligible.

No. 3.
Harry A. Holder, Nashville, Tenn.
Some Uses of High Labial Arch Showing Models of Cases Treated.

No. 4.
Norris C. Leonard, Baltimore, Md.
New Intermaxillary Device.

No. 5.
John A. McPhail, Cincinnati, Ohio.
Orthodontic Eruption of Teeth.

No. 6.
Roy Mitchell, Atlanta, Ga.
Practical Eruption of Mandibular Third Molar.

No. 7.
Harle L. Parks, Atlanta, Ga.
A New Photostatic Device.

No. 8.
W. E. Patton and F. F. Perry, Birmingham, Ala.
Suggestions for the Busy Orthodontists.

No. 9.
W. K. Slater, Knoxville, Tenn.
Stimulating Bone Growth and Tooth Movement by Applying Pressure Directly to the Soft Tissue.

No. 10.
J. Lewis Walker, Norfolk, Va.
Some Results with Lourie's High Labial Arch.

No. 11.
Claude R. Wood, Knoxville, Tenn.
Appliances Used in Treated Cases.

No. 12.
Martin Dewey, 501 Fifth Ave., New York City.
Some Types of Lingual Finger Springs.

Officers of the Society are:

President, Harry A. Holder, Nashville, Tenn.
President-elect, Harry E. Kelsey, Baltimore, Md.
Secretary-Treasurer, Oren A. Oliver, Nashville, Tenn.

The Board of Censors is made up of: W. B. Childs, Chairman, Macon, Ga.; Harle L. Parks, Atlanta, Ga.; and Carlton B. Mott, Asheville, N. C.

Past Presidents are:

1921 Clinton C. Howard
1922 J. A. Gorman
1923 Oren A. Oliver
1924 Herbert C. Hopkins
1925 Joseph E. Johnson

The following are honorary members:

William C. Fisher, New York City
A. LeRoy Johnson, Philadelphia, Pa.
John V. Mershon, Philadelphia, Pa.

The annual spring meeting of the New York Society of Orthodontists will be held March 9, 1927, at the Vanderbilt Hotel, 34th Street and Park Avenue, New York City. It has been planned that both practical and scientific material that is absolutely new and original will be presented. Those who are interested in the growth and progress of this specialty cannot afford to miss this meeting.

American Society of Orthodontists Round Table Discussion

The organization of the round table luncheon in Chicago, May 4, has been partially completed up to this time. Reports that have been turned in so far to the General Chairman are listed below. All members of the American Society of Orthodontists who desire to participate in the round table discussion in Chicago and who have not previously been identified with any particular subject or table will please communicate with Dr. William A. Murray, 636 Church Street, Evanston, Illinois.

Table No. 1.

Topic.—"What is the present status of the laboratory-made orthodontic appliance? Is it doing any service for the public or is it in the aggregate a failure? After all the question, does it benefit the public? Can this question be discussed unbiased by orthodontists?"

Chairman, Dr. C. R. Baker, Evanston, Ill.

Vice-Chairman, Dr. R. C. Willett, Peoria, Ill.

Members of this group up to time of going to press:

Dr. F. R. Blumenthal, Boston, Mass.
Dr. S. W. Bradley, Ottawa, Ont., Canada.
Dr. J. D. McCoy, Los Angeles, Calif.
Dr. H. F. Hoffman, Denver, Colo.
Dr. F. C. Rogers, St. Louis, Mo.

Table No. 2.

Topic.—"On account of the constantly increasing demand for orthodontic service should the general practitioner be encouraged to prepare himself to include orthodontic treatment in his practice?"

Chairman, Dr. Oscar E. Busby, Dallas, Tex.

Vice-Chairman, Dr. P. G. Spencer, Waco, Tex.

Members of this group up to time of going to press:

Dr. E. E. Richardson, San Francisco, Calif.
Dr. John W. Ross, Philadelphia, Pa.
Dr. Wm. E. Flesher, Oklahoma City, Okla.
Dr. N. H. Coleman, Wichita Falls, Tex.
Dr. B. J. MacGinnis, Beaumont, Tex.
Dr. A. B. Conly, Dallas, Tex.
Dr. Martin Dewey, New York, N. Y.
Dr. Frank F. Perry, Montgomery, Ala.

Table No. 3.

Topic.—"Is the present orthodontic training in dental schools adequate?

(a) Should the course of instruction be extended?

(b) Is the present course of instruction comprehensive enough for the student entering general practice?"

Chairman, Dr. Frank M. Casto, Cleveland, Ohio.

Vice-Chairman, Dr. John V. Mershon, Philadelphia, Pa.

Members of this group up to time of going to press:

Dr. L. W. Baker, Boston, Mass.
Dr. E. G. Jones, Columbus, Ohio.
Dr. LeRoy Johnson, Philadelphia, Pa.
Dr. T. L. Grisamore, Chicago, Ill.
Dr. A. J. Hall, Ann Arbor, Mich.
Dr. M. E. Ernst, St. Paul, Minn.
Dr. H. A. Pullen, Buffalo, N. Y.
Dr. W. W. Woodbury, Halifax, Nova Scotia.

Table No. 4.

Topic.—"From clinical experience and observation viewed from an entirely practical and unbiased standpoint, is there any particular outstanding factor which is responsible for the prevalence of malocclusion as observed in everyday practice; if so, what is the practical and popular reaction to this question?"

Chairman, Dr. D. Willard Flint, Pittsburgh, Pa.

Vice-Chairman, Dr. Ralph Waldron, Newark, N. J.

Members of this group up to time of going to press:

Dr. J. A. Burril, Chicago, Ill.
Dr. Joseph Eby, New York City, N. Y.
Dr. O. A. Oliver, Nashville, Tenn.
Dr. Ernest Bach, Toledo, Ohio.
Dr. George W. Grieve, Toronto, Canada.
Dr. H. E. Kelsey, Baltimore, Md.

Table No. 5.

Topic.—"So-called rapid treatment vs. slow and conservative treatment. What is the trend of opinion?"

Chairman, Dr. J. A. Gorman, New Orleans, La.

Table No. 6.

Topic.—"What is the prevailing opinion about the treatment of deciduous dentures, Class I, Class II, Class III, and the expansion of the deciduous mandibular and maxillary arches?"

Chairman, Dr. Herbert C. Hopkins, Washington, D. C.

Vice-Chairman, Dr. Carlton B. Mott, Asheville, N. C.

Table No. 7.

Topic.—"Is the matter of prophylaxis in orthodontic treatment pretty generally neglected in your observation? Should the orthodontists stress this point and discuss it more in order to deliver better service?"

Chairman, Dr. Harry L. Hosmer, Detroit, Mich.

Table No. 8.

Topic.—"The present status of jaw and arch anomalies as correlated with body growth, with special reference to endocrine influences."

Chairman, Dr. Clinton C. Howard, Atlanta, Ga.

Vice-Chairman, Dr. Harry Holder, Nashville, Tenn.

Members of this group up to time of going to press:

Dr. Leo M. Shanley, St. Louis, Mo.
Dr. H. F. Sturdevant, Portland, Ore.
Dr. A. H. Suggett, San Francisco, Calif.
Dr. Milo Hellman, New York, N. Y.
Dr. B. Frank Gray, San Francisco, Calif.
Dr. John A. McPhail, Cincinnati, Ohio.
Dr. Archie B. Brusse, Denver, Colo.
Dr. Albert W. Crosby, New Haven, Conn.
Dr. Oscar Carrabine, New York, N. Y.
Dr. A. LeRoy Johnson, Philadelphia, Pa.
Dr. Ira B. Stilson, Providence, R. I.
Dr. George B. Crozat, New Orleans, La.
Dr. P. R. Ashplant, Newburg, N. Y.

Table No. 9.

Topic.—"Why do teeth decay under bands? What is the best method to prevent such decay? What are the advantages of direct and indirect methods of band making, etc.?"

Chairman, Dr. Joseph E. Johnson, Louisville, Ky.

Vice-Chairman, Dr. Thad Morrison, Atlanta, Ga.

Table No. 10.

Topic.—"From an entirely practical standpoint and from observation in day to day practice, what is the present reaction to the proposition of root absorption during orthodontic treatment?"

Chairman, Dr. A. H. Ketcham, Denver, Colo.

Vice-Chairman, Dr. Milo Hellman, 40 E. 41st St., New York City.

Members of this group up to time of going to press:

Dr. Harry A. Allshouse, Jr., Kansas City, Mo.
Dr. Wm. T. Chapman, El Paso, Tex.
Dr. Robert W. Gaston, New Orleans, La.
Dr. Louis M. James, Kansas City, Mo.
Dr. Chas. C. A. Mann, Seattle, Wash.
Dr. H. L. Morehouse, Spokane, Wash.
Dr. Wm. B. Stevenson, Amarillo, Tex.
Dr. Hugh Tarpley, Quincy, Ill.
Dr. Albert E. Voss, Los Angeles, Calif.
Dr. Homer B. Robison, Great Bend, Kans.
Dr. T. G. Duckworth, San Antonio, Tex.

Table No. 11.

Topic.—"Discussion of patient's comfort during orthodontic treatment."
Chairman, Dr. Charles A. Spahn, Newark, N. J.
Vice-Chairman, Dr. Lowrie J. Porter, New York, N. Y.

Members of this group up to time of going to press:

Dr. Andrew F. Jackson, Philadelphia, Pa.
Dr. Leuman M. Waugh, New York, N. Y.
Dr. Frank Clawson, Plainfield, N. J.
Dr. Chauncey Egel, Westfield, N. J.
Dr. J. D. Locke, Grand Rapids, Mich.
Dr. W. A. Hillis, Greenwich, Conn.
Dr. B. Abell, Toledo, Ohio.
Dr. N. C. Leonard, Baltimore, Md.

Table No. 12.

Topic.—"If the practice of orthodontia is a true science, what is the most feasible plan to extend the service it has to offer to the masses in a competent manner?"
Chairman, Dr. Hugh G. Tanzey, Kansas City, Mo.
Vice-Chairman, Dr. Wm. J. Brady, Kansas City, Mo.

Members of this group up to time of going to press:

Dr. C. M. McCauley, Los Angeles, Calif.
Dr. B. G. DeVries, Minneapolis, Minn.
Dr. Abram Hoffman, Buffalo, N. Y.
Dr. Frank A. Delabarre, Boston, Mass.
Dr. T. O. Gorman, San Antonio, Tex.
Dr. Wm. Humphrey, Denver, Colo.
Dr. J. W. Ford, Chicago, Ill.
Dr. Lloyd S. Lourie, Chicago, Ill.

Table No. 13.

Topic.—"What do you think is the best, most practical and most satisfactory method, from the standpoint of the patient alone, of handling cases one hundred miles or more remote from a skilled orthodontist?"
Chairman, Dr. Oliver W. White, Detroit, Mich.
Vice-Chairman, Dr. Milton T. Watson, Detroit, Mich.

Members of this group up to time of going to press:

Dr. Samuel Lewis, Detroit, Mich.
Dr. Burt Abell, Toledo, Ohio.

Table No. 14.

Topic.—"Is progress in diagnosis desirable? Are intraoral occlusal diagnoses adequate and reliable? Are gnathostatic diagnostic procedures an improvement over occlusal methods?"
Chairman, Dr. B. E. Lischer, St. Louis, Mo.
Vice-Chairman, Dr. A. C. Rohde, Milwaukee, Wisc.

Members of this group up to time of going to press:

Dr. O. W. Brandhorst, St. Louis, Mo.
Dr. M. N. Federspiel, Milwaukee, Wisc.
Dr. C. A. Hawley, Washington, D. C.
Dr. Norman Hillyer, Brooklyn, N. Y.
Dr. F. W. Nash, Washington, D. C.
Dr. F. T. Murlless, Hartford, Conn.
Dr. Allen Scott, San Francisco, Calif.
Dr. Ralph Waldron, Newark, N. J.

Table No. 15.

Topic.—"What would you like in the way of future programs for the American Society of Orthodontists?"

Chairman, Dr. William A. Murray, Evanston, Ill.

St. Louis Study Club of Dentistry—Clinic and Dinner

The St. Louis Study Club of Dentistry will hold its ninth annual clinic and dinner on Saturday, April 2, 1927, at the Gatesworth Hotel, Union and Lindell Boulevards.

The clinic, which will start promptly at two o'clock, will consist of the following subjects:

Dental Ceramics
Fixed Bridgework
Full Denture
Dental Roentgenology
Operative Dentistry
Clinical Dental Prophylaxis
Rizadontia (Root Canal Technic)
Conduction and Local Anesthesia
Tooth Form and Cavity Preparation
Dental Economics
Oral Diagnosis and Diseases of the Mouth

Following the clinic, a dinner will be served at 6:30 o'clock.

The St. Louis Study Club of Dentistry, organized in 1919 and in continuous operation since that time, is maintained for the purpose of teaching advanced dental knowledge to practicing dentists, without charge.

A cordial invitation is extended to all the members of the profession to attend this clinic and dinner.

Bulletins descriptive of the Study Club may be had by addressing Dr. Frank C. Rodgers, 309 Wall Building, St. Louis.

DIRECTORY OF ORTHODONTIC SOCIETIES

The Eastern Association of Graduates of the Angle School of Orthodontia

Officers:

President, Dr. J. Lowe Young, New York City
Vice-President, Dr. George W. Grieve, Toronto, Canada
Secretary, Dr. E. Santley Butler, New York City
Treasurer, Dr. Walter S. Watson, New York City

Executive Committee:

Dr. Milo Hellman, Chairman
Dr. Herbert A. Pullen
Dr. Hugh K. Hatfield

Regular Meetings:

Saturday, January 29th, at Buffalo, N. Y.
Saturday, March 28th, at Boston, Mass.

Annual Meeting:

Monday and Tuesday, May 9th and 10th, at the Hotel Vanderbilt, New York City

Southern Society of Orthodontists

Officers:

President, Dr. Harry A. Holder, Nashville, Tenn.
President-Elect, Dr. Harry E. Kelsey, Baltimore, Md.
Secretary-Treas., Dr. Oren A. Oliver, Nashville, Tenn.

Meetings:

Monday, Tuesday, Wednesday, February 28th, March 1 and 2, 1927, at the Battery Park Hotel, Asheville, N. C.

The Great Lakes Association of Orthodontists

Officers:

President, Dr. Walter S. Sargeant, Toledo, Ohio
President-Elect, Dr. Earl H. Teetzel, Detroit, Mich.
Secretary-Treas., Dr. Ernest N. Bach, Toledo, Ohio

Board of Censors:

Dr. Harry L. Hosmer, Detroit, Mich.
Dr. James D. Locke, Grand Rapids, Mich.
Dr. Frank R. Woods, Detroit, Mich.

Meetings:

Regular meetings are the first Wednesday of November and the first Wednesday of February. The next regular meeting will be held at the Book-Cadillac Hotel, Detroit, Wednesday, February 2, 1927.

The American Society of Orthodontists

Officers:

President, Dr. Joseph D. Eby, New York City
President-Elect, Dr. Walter H. Ellis, Buffalo, N. Y.
Secretary-Treas., Dr. Charles R. Baker, Evanston, Ill.
Librarian, Dr. Abram Hoffman, Buffalo, N. Y.

Board of Censors:

Dr. Oren A. Oliver, Nashville, Tenn.
Dr. H. C. Pollock, St. Louis, Mo.
Dr. William E. Flesher, Oklahoma City, Okla.

Meetings:

Tuesday, Wednesday, Thursday, and Friday, May 3, 4, 5, 6, 1927, at Edgewater Beach Hotel, Chicago, Ill.

The Southwestern Society of Orthodontists

Officers:

President, Dr. W. T. Chapman, El Paso, Texas
President-Elect, Dr. O. H. McCarty, Tulsa, Okla.
Secretary-Treas., Dr. P. G. Spencer, Waco, Texas

Meetings:

November 2, 3, and 4, 1927, at El Paso, Texas.